The Aviation Historian®

The modern journal of classic aeroplanes and the history of flying

SHADOWPLAY

PROCURING THE F-4K/M PHANTOM

ISSUE 25

THE AVIATION BOOKSHOP

ARE YOU READY FOR CHRISTMAS!

Join us for a mince pie and some spectacular bargains during our annual Christmas Open Days - this year we'll be open over 4 days!

The Aviation Bookshop - at the service of all aviation enthusiasts since the 1940s

25% DISCOUNT OFF ALL NEW & SECONDHAND BOOKS AND MODEL KITS

Friday 7th December 10am – 5pm
Saturday 8th December 10am – 5pm
Sunday 9th December 10am – 5pm
Monday 10th December 10am – 5pm

Discount applies to shop sales, phone & web orders. Orders placed via the website will be automatically debited with 25% discount when we process the order.

THE AVIATION BOOKSHOP 31-33 VALE ROAD, TUNBRIDGE WELLS, KENT, TN1 1BS
TEL: 01892 539284 Email: info@aviation-bookshop.com Website: www.aviation-bookshop.com

Published quarterly by:
The Aviation Historian
PO Box 962
Horsham RH12 9PP
United Kingdom

Subscribe at:
www.theaviationhistorian.com

ISSUE NUMBER 25
(published October 15, 2018)

EDITOR
Nick Stroud
e-mail nickstroud@theaviationhistorian.com

MANAGING EDITOR
Mick Oakey
e-mail mickoakey@theaviationhistorian.com

PRODUCTION MANAGER
Amanda Stroud

FINANCE MANAGER
Lynn Oakey

For all telephone enquiries:
tel +44 (0)7572 237737 (mobile number)

EDITORIAL BOARD
Gregory Alegi, Dr David Baker, Ian Bott, Robert Forsyth, Juanita Franzi, Dr Richard P. Hallion, Philip Jarrett HonCRAeS, Colin A. Owers, David H. Stringer, Julian Temple, Capt Dacre Watson

WEBMASTER
David Siddall Multimedia
www.davidsiddall.com

Published quarterly by *The Aviation Historian*, PO Box 962, Horsham RH12 9PP, United Kingdom

© *The Aviation Historian* 2018
ISSN 2051-1930 (print)
ISSN 2051-7602 (digital)

While every care will be taken with material submitted to *The Aviation Historian*, no responsibility can be accepted for loss or damage. Opinions expressed in this magazine do not necessarily reflect those of the Editor. This periodical must not, without the written consent of the publishers first being given, be lent, sold, hired out or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of trade or annexed or as part of any publication or advertising literary or pictorial matter whatsoever.

recycle

If you do not wish to keep your copy of *The Aviation Historian* (impossible to imagine, we know), please ensure you recycle it using an appropriate facility.

MADE IN BRITAIN

Printed in the UK by
The Magazine Printing Company
using only paper from FSC/PEFC suppliers
www.magprint.co.uk

The Aviation Historian®
The modern journal of classic aeroplanes and the history of flying

Editor's Letter

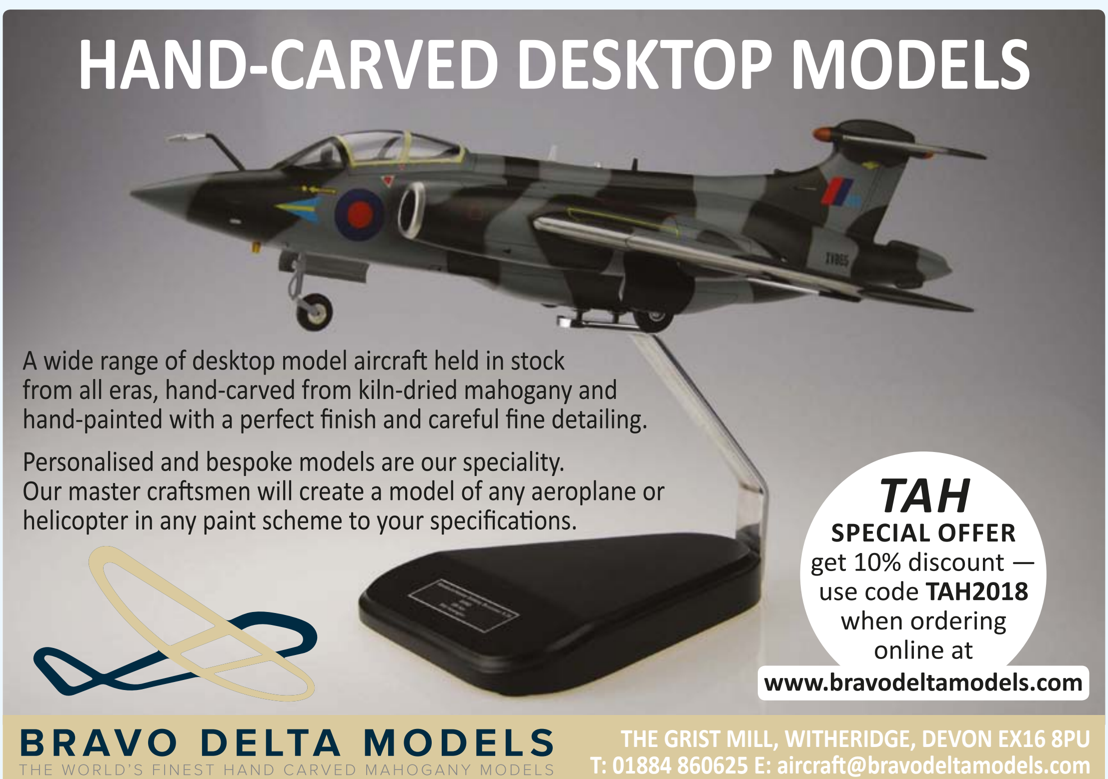
IT IS WITH some astonishment — and a great deal of pride — that I find myself writing the Ed's Letter for the 25th issue of *The Aviation Historian*. When we launched six years ago, our stated aim was to bring thoroughly researched, well-illustrated articles — offering new insights and fresh perspectives — to a readership with a better-than-entry-level knowledge of aeronautical history, tired of seeing the same old themes recycled endlessly into predictable retreads. Our ever-climbing sales curve has proved that we were on to something, and it's thrilling to be able to look back and survey what has grown into a substantial body of work from some of the world's finest historical aviation specialists. Indeed, the last 24 issues have contained a cumulative total of more than 300 articles from contributors all over the world, providing in-depth information and analysis on aviation history from Alaska to Zimbabwe. Thanks to the unswerving dedication of the *TAH* team, the invaluable guidance of our Editorial Board and the remarkably high standards of our authors — plus the vital ongoing encouragement and support from you, our loyal readership — we continue to soar onwards and upwards.

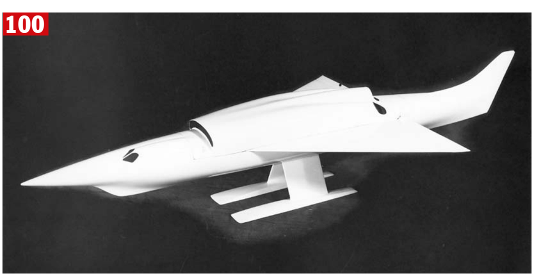
In *TAH25* we take a typically far-ranging approach, with Viscounts, Dragon Rapides, Harrows and Doves covering the civil aviation angle, while articles on the Luftwaffe's bombing capability in 1938, the UK's painful procurement of the F-4K/M Phantom, the career of the Soviet Union's Yak-28PP "SAM-jammer" and the RAF Far East Flight's epic 1927–28 tour of Asia and Australia fulfil the military brief. Of course, it wouldn't be *TAH* without the "weird and (not so) wonderful" — enter Convair's pre-Sea Dart waterborne jet fighter projects and France's ill-fated SE.1010. A very warm welcome to this "silver jubilee" issue — here's to the next 25!

Nick Stroud

FRONT COVER ***With wingtip vortices trailing, two 56 Sqn Phantom FGR.2s bank over the North York Moors.*** RAF AIR HISTORICAL BRANCH

BACK COVER ***The immaculately attired crew of a Continental Airlines "Viscount II" prepare to board circa 1958.*** UNITED AIRLINES ARCHIVE


FROM THE EARLIEST DAYS OF MANNED-FLIGHT, THROUGH TO THE PRESENT DAY AND BEYOND - XTENDED HAS GOT AVIATION COVERED.
LISTEN IN NOW, FOR FREE
HANDS UP - WHO'S DOWNLOADED XTENDED?
XTENDED
EUROPE'S PREMIER AEROSPACE INTERNET RADIO PROGRAMME
WWW.AVIATION-XTENDED.CO.UK

HAND-CARVED DESKTOP MODELS
A wide range of desktop model aircraft held in stock from all eras, hand-carved from kiln-dried mahogany and hand-painted with a perfect finish and careful fine detailing.
Personalised and bespoke models are our speciality. Our master craftsmen will create a model of any aeroplane or helicopter in any paint scheme to your specifications.
TAH SPECIAL OFFER
get 10% discount — use code TAH2018 when ordering online at
www.bravodeltamodels.com
BRAVO DELTA MODELS
THE WORLD'S FINEST HAND CARVED MAHOGANY MODELS
THE GRIST MILL, WITHERIDGE, DEVON EX16 8PU
T: 01884 860625 E: aircraft@bravodeltamodels.com



CONTENTS Issue No 25

AIR CORRESPONDENCE

Letters to the Editor

Hitler's rocket havens

SIR — *TAH24* was another classic issue — I particularly liked the B-47 piece and the one about possible Russian V2 flights shortly after the war. I did just want to fire off a little nitpicking correction: on page 129 (bottom of the left-hand column) the writer says that "Today it is known that the German rocket establishment at Peenemünde had already been relocated to Nordhausen in central Germany before the end of the war". Actually, this is not so.

In fact, after the RAF raid on Peenemünde of August 17–18, 1943, the entire flight testing programme was moved to Blizna in Poland, where 204 V2 rockets were test-fired for development and training between November 5, 1943 and June 30, 1944. Nordhausen comprised the production and assembly facilities adjacent to a slave-labour camp from which the workforce was obtained starting in August 1943 — a date merely coincidental with the air raid on Peenemünde — splitting all technical development/testing/training, at Peenemünde and then Blizna, from the Mittelbau production lines at Nordhausen near the Harz mountains. However, while a few test launches did take place from Peenemünde, it was decided to move all those operational activities to Blizna so as to divert attention from Peenemünde and to give the impression that a greater degree of damage had been inflicted by the RAF.

All the main design and drawing offices remained at Peenemünde, but considerable movement of tracking facilities was required for the flights from Blizna, a site which was evacuated in July 1944 when V2 tests moved to the Tuchola Forest to escape the Russian steamroller. There, 224 V2 rockets were launched between September 12, 1944, and January 11, 1945. Over a two-week period from October 2, 1945, the British launched three V1 rockets under Operation *Backfire* from a site near Cuxhaven, the first such rockets fired by anyone outside Germany. We also narrowly missed keeping Dr Kurt Debus, who was interrogated at Orfordness before being snatched by the Americans one night, very quickly to end up in the USA (Truman hated the idea that the British would get their hands on rocket technology and had already torn up the Hyde Park Agreement to share "secrets" with the UK). Debus ended up as Director of the Kennedy Space Center throughout the glory years.

I hope you don't mind my mentioning this; it is a fascinating story and one that I wanted to correct for your files. One of the first tasks I was charged with on arrival in the USA was to fly down to Florida and dismantle a V2 rocket engine — to get some greasy-elbow/hands-on experience with rocket engines (instigated by an "aha!" moment from my supervisor when I told him I used to dismantle the engine of my racing motorcycle in the UK to attempt a performance enhancement!).

Dr David Baker *Rye, East Sussex*

Chile's Breda blues

SIR — I just finished reading *TAH24*, and what a wonderful mix of features. Well done, crew!

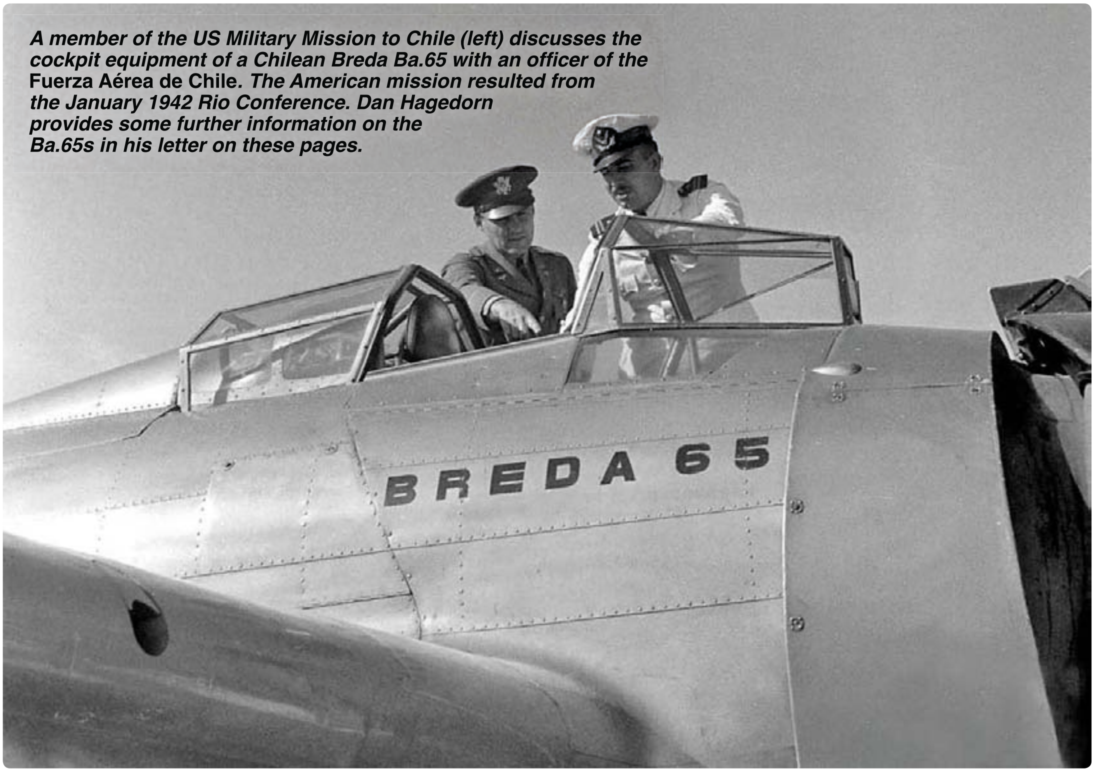
I have a few comments that you may want to consider adding to the excellent article on the ill-fated Breda Ba.65s in Chile by Amaru Tincopa.

The Nationalist government in Chile, which by February 1940 had been replaced, came under

Convair canoe confusion

In* TAH24's Air Correspondence*, we edited Giulio Valdonio's letter to indicate that the rearward-located "speed canoe" aerodynamic bodies on the Convair 990's wings could not be allowed to contain fuel or other heavy masses because such weights "would cause centre-of-gravity problems". Giulio has written to us to point out that the true reason was not c.g. considerations, but aero-elasticity: masses behind the wing's torsional elastic axis would affect its aeroelastic stability. Blast, we should have thought of that, and we stand corrected and apologetic! — Ed.

Send readers' letters for publication to: Air Correspondence, The Aviation Historian, PO Box 962, Horsham RH12 9PP, UK, or (preferably) e-mail them to the Managing Editor at mickoakey@theaviationhistorian.com



A member of the US Military Mission to Chile (left) discusses the cockpit equipment of a Chilean Breda Ba.65 with an officer of the* Fuerza Aérea de Chile. *The American mission resulted from the January 1942 Rio Conference. Dan Hagedorn provides some further information on the Ba.65s in his letter on these pages.

GERMAN LUER VIA SANTIAGO RIVAS

intense criticism for the purchase of the Ba.65s and Nardi FN.305s. Even the Italians rushed to point out that the Chilean acceptance mission had refused their help in the assembly of the aircraft (even though they arrived in December 1938, none of the Ba.65s, contrary to what Amaru reported, were assembled until after August 19, 1939!) or in the training of crews, the *Fuerza Aérea de Chile* (FACh) feeling — as Amaru pointed out — that sending several FACh officers to Italy would be sufficient. However, when the aircraft arrived in Chile, not a single one of those trained officers was present and, as a direct result, problems with erecting these complex aircraft were encountered immediately. For example, the steel-tube engine mounts —- which gave such trouble shortly thereafter — lacked instructions of any sort as to their proper installation.

By November 2, 1938, even before the aircraft arrived, two FACh squadron commanders, Molina and Lacassie, were "voluntarily retired" from the service when they came under investigation on charges of "irregularity and graft" in connection with the purchase. Amaru did not mention these officers, probably because they were part of the original purchasing commission sent to Europe in 1937, when the sale was contracted, and not amongst the officers he noted as being sent to learn about the operation of the aircraft. Although Amaru quite accurately relates that the last flight of a FACh Ba.65 was in 1942, they remained listed on FACh Air Orders of Battle as late as April 17, 1943, when 14 were reported as "junk".

One final note: the actual contract for the Ba.65s described them not as "fighters" or even "attack"-category aircraft but, rather, as "general utility planes".

Dan Hagedorn *Maple Valley, WA, USA*

Amaru Tincopa responds: "It is true that the Italians were eager to avoid any further responsibilities regarding the sale of these aircraft. Delivery and erection details, however, were taken from actual documentation from Chilean Air Force records. Unfortunately, Dan relies too heavily on the US intelligence reports which, in the past, have been proven not completely accurate in most cases".

Skyways remembered

SIR — Having already read the two most important books relating to Skyways — *Skyways Byways* by John W.E. Newby, and *Skyways at Lympne* by Dick Gilbert — I was pleasantly

AIR CORRESPONDENCE *Letters to the Editor*

TIME FLIES Wall calendars for 2019 to consider . . .

WHERE HAS 2018 (almost) gone? Christmas goods are in the shops, and it's time to plan for the new year — so here is a choice of aviation calendars to keep track of dates and provide aeronautical decoration. The two large (20in x 14in) GHOSTS calendars, by the doyen of air-to-air photographers, Philip Makanna, feature Great War and Second World War subjects respectively. Order them for $14.99 + p&p apiece from **www.ghosts.com** or GHOSTS, 665 Arkansas St, San Francisco, CA 94107, USA.

The smaller one (8¼in x 11¾in) is the Cross & Cockade International calendar, featuring paintings of World War One subjects by 12 artists. It is available for £11 inc p&p (UK), £12.50 Europe and £13.50 RoW, ordered direct from **www.crossandcockade.com**, which also has details of CCI's journal and other projects. Profits from the calendar support the upkeep of the British Air Services Memorial at St Omer.

surprised to find the two articles by Brian Turpin in your issues 17 and 19.

I was privileged to have shared (albeit to a minute extent) in the Skyways history, having been a regular passenger on flights between Lympne and Beauvais in the Sixties.

My family lived in Folkestone, Kent, where I was raised until 1957, when I joined Lloyds and National Provincial Foreign Bank and was posted to Paris. I returned at weekends to visit my parents.

I was lucky enough not only to experience the Dakota on grass runways, but also later to enjoy the relative luxury of the Avro 748!

Despite the "bogging down" of aircraft and delays due to fog, I enjoyed very happy flights with Skyways and no major incidents.

Reginald Howarth *Bourg-en-Bresse, France*

Golden Crown conundrum

SIR — Thanks for the very interesting article on the Iranian Golden Crown aerobatic team, written by Babak Taghvaee, in Issue 21 of *The Aviation Historian*.

With regard to why some photographs show Western numerals on the fins of the Northrop F-5s, and some show Arabic numerals, I initially thought there is a very simple explanation. Western numerals (and serials, and other titles) were painted on the port side, while Arabic numerals etc were painted on the starboard side. If the majority of photographs show Arabic numerals, this is simply because, for whatever reason, most must have been taken of the starboard side!

When, however, pictures emerged showing Arabic numerals on the port side, I was going to suggest that it was just a painting error, and someone didn't follow the instructions correctly (it wouldn't be the first time . . .). But after a bit more research, I discovered this rather interesting webpage — www.iiaf.net/goldencrown/gcphotoarch.html — which scotched that idea. There seem to be three photographs taken at the same time, and in one it can be seen that all the tails have Arabic numerals on the port side, although the titles and serials are still in Western script. One of these photographs is dated 1977.

I still think the basic idea that one side is painted in Western script and the other in Arabic is reasonably sound (the same idea can be found with certain Arab airlines), but the only thing I can think of to explain this anomaly is that perhaps originally the tail numbers were Arabic on both sides (to benefit the general population, many of whom would possibly not easily recognise Western numerals). Then, later, perhaps in anticipation of the proposed Paris visit, maybe it was decided to use Western numerals on the starboard side in addition to the other script, for the benefit of a Western

Send readers' letters for publication to: Air Correspondence, The Aviation Historian, PO Box 962, Horsham RH12 9PP, UK, or (preferably) e-mail them to the Managing Editor at mickoakey@theaviationhistorian.com

audience. Maybe . . . this is pure supposition on my part!

Perhaps the author knows?

Phil Hawks *via e-mail*

Babak Taghvaee responds: "Thank you for sharing this feedback with me. According to the IIAF standards which were later inherited by the IRIAF, all the aircraft had to carry Persian and English serial numbers. The serials on the nose and rear fuselage on the port side are Persian while the number on the fin is English on the same side. On the starboard side the arrangement is the complete opposite.

Now, let's discuss the large numerals on the aeroplanes' fins that Phil raised. He is absolutely right. In the beginning, both sides were written in Persian numerals, because the team was planning to display only within the country. As he said, later on they replaced the port-side tail number with English numerals during the display period at Shiraz, especially when there were huge foreign audiences there. In 1979, when the team was dissolved, they had English numerals on the port side and Persian on the starboard side".

All aboard the Big Bunny

SIR — Looking through *TAH24*, what did I see but the fact that you are reprinting back numbers of *TAH1*, with one of the photographs showing Hugh Hefner and his black Douglas DC-9.

I have a special reason for wanting a copy of the issue that contains the article about Hugh Hefner's "Big Bunny".

I and a friend of mine — who was a show-business journalist for the Press Association — spent a whole day on that aircraft when it came over to the UK in, I think, 1972. From what I remember it was parked on the south side of Heathrow Airport.

What do I remember most of all? — lots of young ladies wearing what seemed to be spray-on black satin bunny costumes, plus they all had what I would describe as an abnormally high centre of gravity. Plus in the aircraft there was a large circular bed about 8ft in diameter *[actually it was elliptical, just to be absolutely accurate — Ed]* with a seatbelt running across it. There are a few other things I recall, but they were the most memorable.

David Chart *Coleshill, Buckinghamshire*

DELECTABLE . . . AND COLLECTABLE

Not got the full set yet? Don't wait a moment longer!

ALL 24 BACK-ISSUES ARE CURRENTLY AVAILABLE
(we even reprinted Issue No 1 this year, by popular demand)

Buy your missing issues direct from our website:

www.theaviationhistorian.com

TAH™

Not online? Not a problem! Call or write and we'll be happy to help — find our contact details on page 3

THE CASE FOR APPEASEMENT

Munich & the 1938 "Dodgy Dossiers"

In early 1938, with Hitler aggressively pursuing his expansionist agenda, Neville Chamberlain called for an in-depth assessment of Germany's bombing capability. **GREG BAUGHEN**, author of *The Rise of the Bomber*, digs further into the archives to reveal how the resulting reports may have presented a misleading case for appeasement at Munich 80 years ago

SOME 15 YEARS ago, in 2003, the British Prime Minister, Tony Blair, used what transpired to be suspect information on Saddam Hussein's ability to deploy weapons of mass destruction to justify an invasion of Iraq; 65 years before that, two more "dodgy dossiers", with assessments of German weapons of mass destruction, played a part in making sure Britain did *not* go to war.

GATHERING WAR CLOUDS

In the spring and summer of 1938, Europe was on the brink of war. Hitler was demanding the annexation of the Sudetenland border region of Czechoslovakia, a region largely populated by ethnic Germans. France was pledged to come to the aid of Czechoslovakia if attacked, and Britain felt it would be obliged to join France if it came to war. The Prime Minister, Neville Chamberlain, asked his three Chiefs of Staff for an assessment of Britain's military strength and the country's prospects in a war with Germany.

It was the age of the bomber. Future wars were envisaged much the same as a future generation would view a nuclear conflict. In the same speech in which Stanley Baldwin had warned the nation that "the bomber would always get through", he also predicted that the next great war would see the end of European civilisation.[1]

Nations and politicians alike were gripped by fear of what the bomber might do. In April 1937, during the Spanish Civil War, 45 tons of bombs dropped on Guernica reportedly killed 1,700 civilians and injured another 800. It was a stark demonstration of the destruction bombers could wreak, and moved the Archbishop of Canterbury to coin the phrase "weapons of mass destruction". The exaggerated death toll (still tragically high, but probably less than 300) seemed to justify the grim apocalyptic talk of the time. It also seemed to confirm British Air Ministry predictions that each ton of bombs dropped would inflict 50 casualties.

The idea that the bomber, with the explosive, chemical and bacteriological weapons it could carry, might bring about the end of civilisation was based more on imagination than hard evidence, but nobody wanted to put the matter to the test. The fear the bomber provoked ensured it became a fearsome diplomatic weapon. Foreign policy and negotiating positions were determined by the strength of bomber forces. Politicians wanted the security that came with the ability to retaliate, and Chamberlain was no exception. However, the dossiers his Chiefs of Staff drew up did not provide the reassurance he wanted. But how accurate were they?

THE FIRST DOSSIER

With the benefit of hindsight we now know that in 1938 the German High Command knew that the Luftwaffe was not capable of launching an effective attack on the UK from bases in Germany. *General* Hellmuth Felmy had been asked to assess what the Luftwaffe would be capable of in a war with Britain, and he reported that a successful aerial assault would only be possible from captured airfields in the Netherlands and Belgium.[2] Yet in September 1938, with German forces massing on the Czech frontier, Chamberlain was told that from bases in Germany, the Luftwaffe could drop up to 600 tons of bombs on Britain every day, and would be able to maintain this for at least two months.

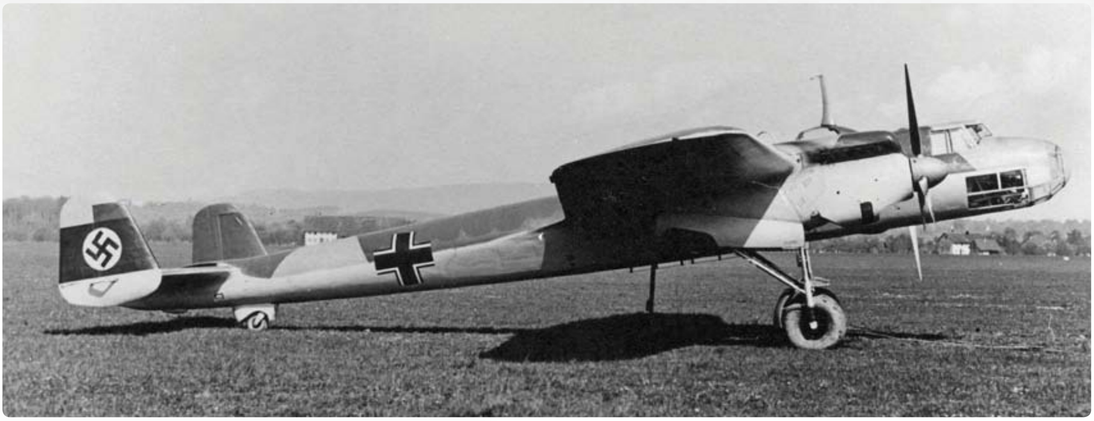
At 50 casualties per ton (one-third fatalities), this meant 600,000 dead and 1·2 million seriously injured. As it turned out, two years later during the first two months of the Blitz, with bombers flying every night from airfields just the other side of the Channel, the Luftwaffe managed a daily average of less than 200 tons. How could the Air Ministry have got it so wrong?

Working out how many tons a bomber force can drop is not straightforward. Generally, the

ABOVE RIGHT ***Neville Chamberlain became Prime Minister on Stanley Baldwin's retirement in May 1937. Often regarded in a negative light as an appeaser of Hitler, he was nevertheless steely in his dealings with the Führer, and in the wake of Munich said that "we should relax no particle of effort until our deficiencies are made good".***

CHRIS GOSS COLLECTION

ABOVE ***By the end of 1938 the Luftwaffe's dive-bomber units had begun equipping with the Junkers Ju 87B, a modified development of the original A model, incorporating a Jumo 211 engine, aerodynamic refinements and a lighter, spatted undercarriage. It went on to become a potent symbol of Germany's "Blitzkrieg" style of warfare.***



TAH ARCHIVE

ABOVE ***The sleek state-of-the-art Dornier Do 17 entered Luftwaffe service in early 1937, the first production model being the Do 17E, as seen here. This variant carried a standard load of 1,100lb (500kg) of horizontally-stored bombs, which could be increased to 1,650lb (750kg), but — crucially — the latter only for reduced-range sorties.***

BELOW ***The bomber that would become a symbol of German air power above all others was the Heinkel He 111, which initially had a conventional "stepped" nose arrangement, as seen here, before the much better-known, and rather more sinister, fully glazed nose was introduced on the He 111P and retained on all subsequent variants.***

CHRIS GOSS COLLECTION

CHRIS GOSS COLLECTION

ABOVE ***The first prototype of the Junkers Ju 86 made its maiden flight on November 4, 1934, and was unusual in that the type was designed from the outset to be powered by a pair of 600 h.p. Junkers Jumo 205 diesel engines, as seen fitted to these Ju 86Ds of 4./KG 253. Other variants of the Ju 86 were fitted with BMW 132 radial engines.***

more bombs an aircraft lifts into the air, the less fuel it can carry, so how many bombs a bomber force can drop depends on how far away the target is. To avoid the complications of range, one simple measure used at the time was to calculate the "total bomb-lift" of a bomber force. This was the maximum bomb-load the theoretical frontline strength of a bomber force could lift into the air, disregarding all other issues such as range or serviceability. It was crude, but as long as the same criteria were used, it gave a rough idea of how air forces compared, without making an attempt to estimate the bomb tonnage that could be delivered to any particular target.

The first dossier was presented to the Cabinet in March 1938. In many respects it was rather vague and one suspects that this was deliberate, in order to prevent too close a scrutiny of the figures involved. Exactly how these figures were arrived at has not survived, but methods used during the summer of 1938 and information on aircraft performance available to the Air Ministry at the time make it possible to work out the probable thinking behind the figures.

The Air Staff used the total bomb-lift figure to give the government an idea of how the British, French and German air forces compared. For the Luftwaffe the Air Ministry came up with a figure of 1,825 tons. Interestingly, the report chose not to include a specific RAF figure but claimed the equivalent combined British and French forces would manage just 575 tons.

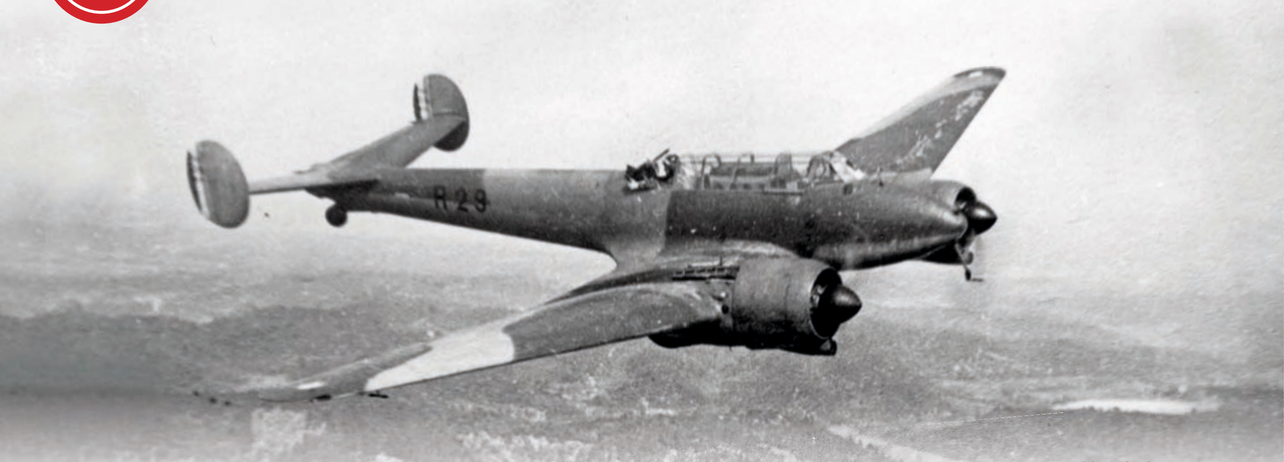
The German bomb tonnage figures were based on a bomber force consisting of 1,300 long-range bombers and 270 Junkers Ju 87 Stuka dive-bombers. (Reserves with frontline squadrons were excluded.) In line with the thinking behind the total-lift approach, all bombers were included regardless of whether they were being phased out, like the Junkers Ju 86, or lacked the range even to reach Britain, like the Ju 87. This figure assumed each bomber squadron had 12 aircraft (plus three in reserve), an assumption based on comments in December 1937 attributed to Erhard Milch, who was responsible for organising German air expansion.[3]

The Air Ministry believed that the maximum bomb-load the Heinkel He 111 could carry was 4,400lb (1,995kg); the Dornier Do 17 could manage 1,650lb (750kg) and the Ju 86 could uplift 2,205lb (1,000kg). Using these figures does indeed give a total of 1,825 tons. The report was not claiming that the Luftwaffe could deliver this bomb tonnage; it was purely a theoretical maximum figure for comparative purposes.

The lifting capacity the German bombers were credited with was, on balance, broadly correct. The He 111E, then just entering service, could carry 4,400lb, but the He 111B it was replacing only carried 3,307lb (1,500kg). On the other hand, the Do 17M, then beginning to replace the Do 17E, carried 2,205lb rather than 1,650lb.

THE FRENCH & BRITISH BALANCE

The 575-ton figure for the Anglo-French force suggested a clear three-fold German advantage. The French bomber strength was given as 456 aircraft, which was approximately correct. With



ALAIN J. PELLETIER COLLECTION

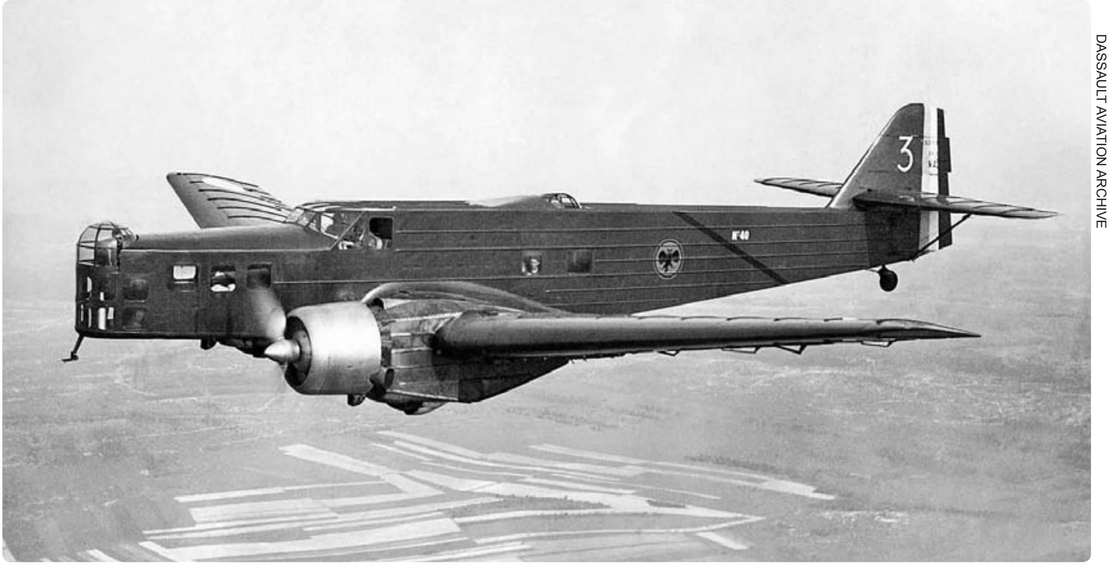
ABOVE ***Originally designed to a 1934 specification for a three-seat multi-role aircraft capable of undertaking the escort and bomber interception roles, the Potez 63 formed the basis for the 633 bomber, although its load of 880lb (400kg), comprising 8 x 110lb (50kg) bombs, was somewhat feeble in comparison to those of the German bombers.***

TAH ARCHIVE

ABOVE ***With its fixed undercarriage and thick wings, the Amiot 143 was essentially a bomber designed on late-1920s principles, but built and adopted for service in the mid-1930s. Nevertheless, the 143 could theoretically carry a bomb-load of 1,800lb (800kg) internally and 1,800lb externally — more than most of its RAF contemporaries.***

BELOW ***Rather more up to date was the Lioré et Olivier LeO 45 twin-engined medium bomber, the prototype of which is seen here. With the replacement of its original Hispano-Suiza engines with Gnome-Rhône 14Ns, the type was designated LeO 451 and entered service in 1939. The type's standard bomb-load was 7 x 200kg (440lb) bombs.***

TAH ARCHIVE



DASSAULT AVIATION ARCHIVE

ABOVE ***Stylistically and technologically falling somewhere between the lumbering but capacious Amiot 143 and the more refined but less capable LeO 45 and Potez 633 was the Bloch MB.210, the prototype of which made its first flight in November 1934. At a maximum of 3,520lb (1,600kg), the MB.210's bomb-load was impressive.***

such a large French force, and each aircraft typically carrying about a ton of bombs, it seems that the *Armée de l'Air* (French Air Force) accounted for most of this 575-ton figure. The Air Ministry had a fairly accurate breakdown of the different types of bomber available to the French, although the bomb-load these could carry was generally underestimated.[4] Using the figures available to the Air Ministry, the French bomb-lift would be in excess of 400 tons. This would suggest that the RAF was contributing less than 200 tons to the Allied total.

At the time, RAF Bomber Command possessed 67 squadrons comprising 804 aircraft (excluding squadron reserves). Counting all aircraft regardless of range, and using the maximum bomb-load each could lift, should have resulted in a bomb-lift slightly in excess of 500 tons. However, the Air Ministry seemed determined to reduce this figure. All the aircraft that were being phased out of service were excluded. These included the Handley Page Heyford and Fairey Hendon, both of which were dismissed as obsolete and "operationally useless".[5] They were not Britain's finest creations æsthetically, but they were not ancient relics from a previous era that were falling apart through old age. The last Heyford had come off the production line in 1936 and the last Hendon in 1937. In March 1938 they were still relatively new.

The Heyford looked ungainly, but the latest and most-produced Mk III version carried an impressive 3,500lb (1,585kg) bomb-load. The Hendon was one of the few bombers the RAF had in its inventory that could reach Berlin. Could the Hendon and Heyford contribute anything to a precision attack on German industry? Of course not, but nor could the Handley Page Harrow, Vickers Wellesley and Armstrong Whitworth Whitley night bombers the Air Ministry was including in its figures. However, as weapons of retaliation, the Hendon and Heyford had as much chance of finding and hitting German cities by night as any other bomber the RAF had. For his negotiations with Hitler, Chamberlain wanted to know that he could fight fire with fire. He was not interested in whether his bombers could knock out key oil facilities or power stations; he just needed to know that the RAF could respond in kind to any German assault.

Discounting the six Heyford squadrons alone reduced the RAF bomb-lift figure by about a fifth. In fact, of the available 67 bomber squadrons, only 35 were used to calculate the total bomb-lift. These comprised ten squadrons of Bristol Blenheims, ten with Fairey Battles, five with Harrows, five with Whitleys and five with Wellesleys. The combined lift of this force should have been 328 tons. However, the bomb-loads used do not appear to be the maximum these aircraft could carry. The Air Ministry tables that list the performance of British and foreign designs give the maximum bomb-load for German types, but for British types only the load that could be carried to maximum range. The table lists the bomb-load for the Wellesley as 1,000lb (455kg) rather than its maximum of 2,000lb (910kg), the Whitley 1,500lb (680kg) instead of 3,000lb (1,360kg), and the Harrow 1,500lb rather than 2,800lb (1,270kg). It seems these lower figures were used, giving the 35 usable squadrons a bomb-lift of 217 tons.

This, however, still does not tally with the

TAH ARCHIVE

ABOVE ***The unusual single-engined Vickers Wellesley, incorporating extremely high-aspect-ratio wings, entered RAF service with No 76 Sqn in April 1937. Capable of carrying a bomb-load of 2,000lb (910kg), the type served with ten squadrons at home and overseas, including No 148 Sqn, with which this example, K7717, served during 1937.***

CHARLES E. BROWN / TAH ARCHIVE

ABOVE ***In common with the Armée de l'Air's Amiot 143, the Fairey Hendon was largely designed to a late-1920s specification, in the latter's case B.19/27 for a "Night Bombing Landplane". The Hendon became the first all-metal low-wing cantilever monoplane to join the RAF when it entered service with No 38 Sqn at Mildenhall in late 1936.***

BELOW ***Also designed to Specification B.19/27, the Handley Page Heyford was the last of the RAF's biplane heavy bombers, and entered service with No 99 Sqn in November 1933. Despite being capable of uplifting a meaningful bomb-load of some 3,500lb (1,585kg), the Heyford (along with the Hendon) was discounted as "operationally useless".***

TAH ARCHIVE

TAH ARCHIVE

ABOVE ***One of the RAF's more advanced machines in 1938, the single-engined Fairey Battle light bomber could carry twice as many bombs twice as far as the Hawker Hind it replaced. The Battle entered RAF service in May 1937, but was also — rather mysteriously — excluded from the total bomb-lift figure for the RAF presented in 1938.***

combined 575-ton total for the Anglo-French force. It seems ways were found of further reducing the Anglo-French bomb-lift figure. The report emphasised that ten of the 35 usable squadrons were not capable of reaching German territory from bases in Britain. The report also went on to describe the aircraft equipping ten of these squadrons as "an obsolete light bomber type of aircraft, which is of short range and of little use against modern fighters". To the casual reader, these two references might seem to refer to two different sets of bomber squadrons. At first sight they also both appear to be describing the Hawker Hinds still in service. These did indeed lack the range to reach Germany from airfields in Britain, but they were not counted in the 35 available squadrons. The Fairey Battle is the next most likely candidate, although it is not a particularly good fit. The Battle had many problems but range was not one of them, and the aircraft could comfortably reach Germany. It is difficult to avoid the conclusion that the Air Staff was getting the capabilities of the Hawker Hind and the Fairey Battle mixed up.

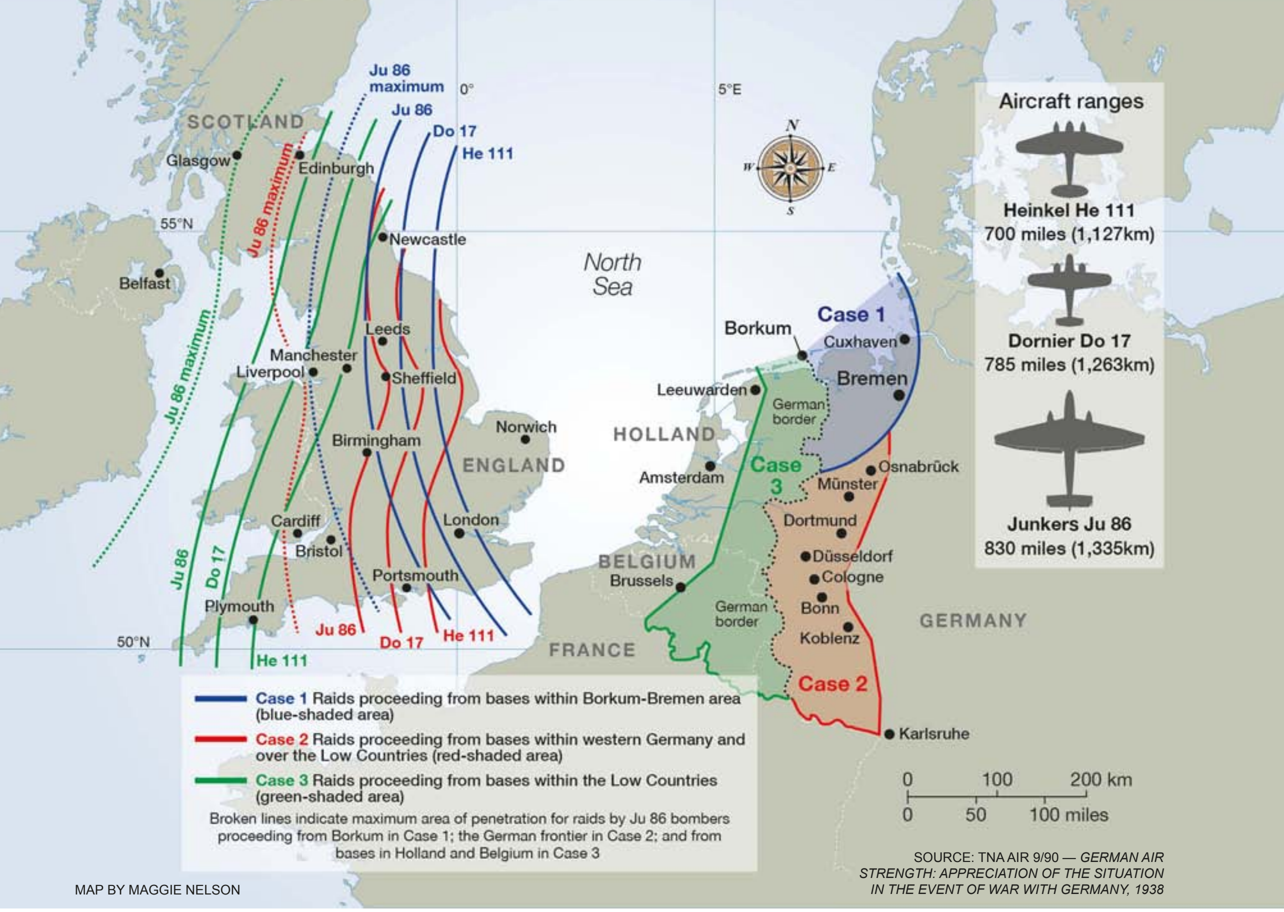
It appears that the Air Ministry felt justified in excluding the Fairey Battle from its total lift figure. The type has acquired a rather particular reputation and, given its history, few would see much wrong with its exclusion. In March 1938, however, the Battle was not as vulnerable as it would be when it had to face the Luftwaffe's Messerschmitt Bf 109Es, and it was certainly no more vulnerable than the Stuka. It was faster than the Ju 86, and was credited by the Air Ministry with a top speed of 193 m.p.h. (310km/h). Nevertheless, it seems it was excluded, reducing the British contribution to around 160 tons. With the French providing a little more than 400 tons, we get near the Anglo-French total of 575 tons. By no stretch of the imagination was the Air Ministry using Bomber Command's total bomb-lift. The true Anglo-French total was closer to 1,000 tons.

LIES, DAMNED LIES & STATISTICS

So much for what the bomber forces could lift in theory, but how much could they deliver in practice? This was perhaps the more crucial issue. Could the German bomber force turn London into a scene from H. G. Wells's *Things to Come*? Could the Luftwaffe deliver the much-feared knockout blow?

For this calculation only the 1,300 medium bombers that could reach Britain counted. How many of these bombers Germany could afford to use against Britain was difficult to estimate. Germany was planning to invade Czechoslovakia and might also have to use its bombers against France. There was, however, a theory that as soon as Britain showed any interest in intervening in the Sudetenland dispute, Hitler would postpone his attempt to invade Czechoslovakia and turn all his attention to his enemies on his western flank. The theory further suggested that France was the weak link in the Western alliance and that if Britain was defeated, France would soon follow. Hitler might therefore decide to knock Britain out of the war first with an all-out assault with all 1,300 available medium bombers.[6] It was perhaps rather improbable, but arguably the Air Ministry was right to consider this worst-case scenario.

The 1,300-strong German medium bomber force could carry 1,700 tons. However, taking



MAP BY MAGGIE NELSON

SOURCE: TNA AIR 9/90 — *GERMAN AIR STRENGTH: APPRECIATION OF THE SITUATION IN THE EVENT OF WAR WITH GERMANY, 1938*

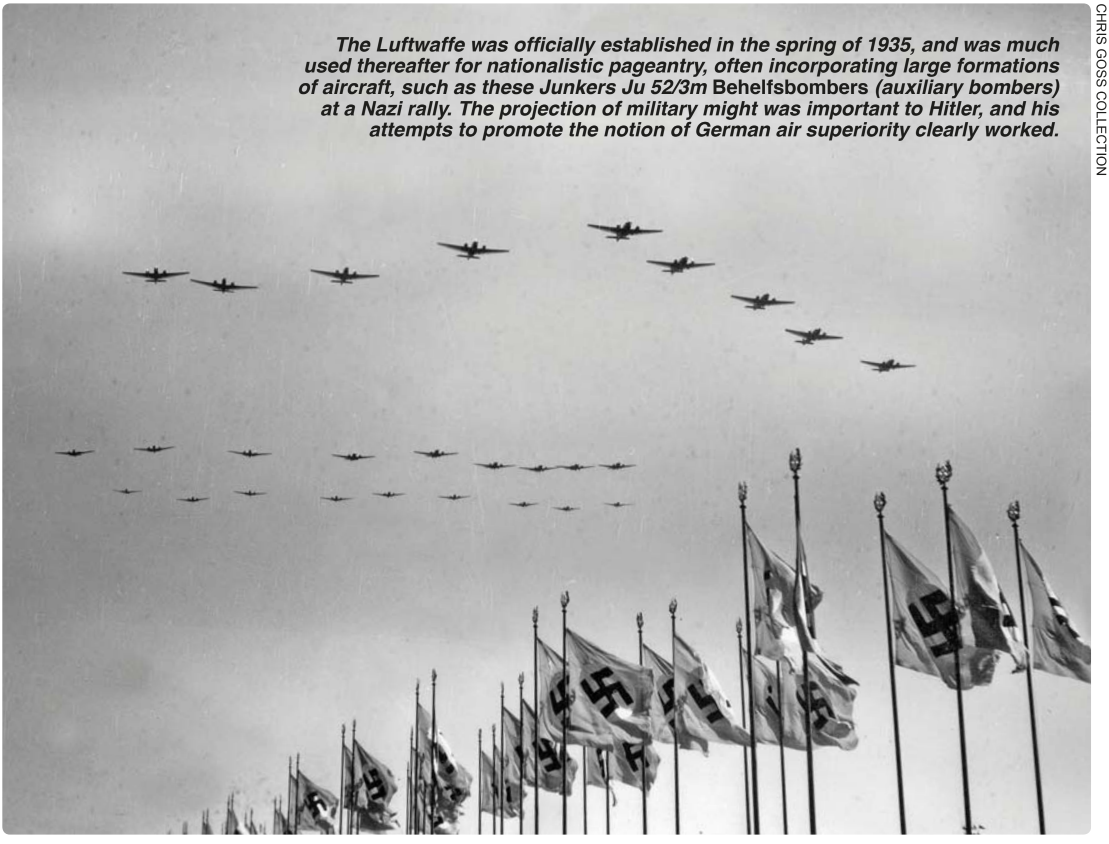
into account the fact that that only a proportion of German bombers would be serviceable at any given time, and that a squadron's bomber crews could not be expected to fly continuously, the Air Ministry estimated that the average figure that could be dropped on Britain "was unlikely to be less than 400 tons a day" and that this could be maintained for at least two months.[7] It was perhaps a slightly pessimistic assessment.

Bomber Command's squadrons were expected to fly 27 sorties in the first week and then maintain 18 sorties per week thereafter.[8] If the Air Ministry had used the same criteria for the German bomber force, it would have come up with an impressive 534 tons a day for the first week, but only 356 tons a day after that.

The report was rather vague about where these bombs might actually fall. It quoted at length previous apocalyptic Air Staff accounts which concluded that Germany would attempt to deliver a "'knockout blow' against the country" which would involve "a ruthless attack on London or other centres of population"; but the 400-ton figure in the report referred only to what could be dropped on Britain, rather than any particular target in Britain.

There was good reason for this caginess. There were major doubts about how far the Luftwaffe could penetrate and, in the months that followed the release of the March 1938 dossier, these doubts would grow. It was not by any means straightforward to reach London from airfields in Germany without infringing Dutch and Belgian neutrality, and at this stage Hitler was unlikely to want to add these two countries to his growing list of enemies. Apart from anything else, the Ruhr was only a few miles from Germany's Dutch frontier and The Netherlands and Belgium provided a natural barrier to British bombers. Bringing these two countries into the war would open up a direct route to the Ruhr for Bomber Command. Germany was unlikely to expose its most important industrial centre to air attack. The Air Ministry acknowledged that it would be difficult to find enough airfields for the entire German bomber force to operate from in the north-west corner of Germany. Nevertheless, assuming they could be found was perhaps just about justified as a worst-case scenario.

Doubts were also growing about exactly how many bombers Germany had. First, it emerged that Milch had never actually said he was planning to increase German bomber strength to 12 aircraft per squadron, and the Air Ministry had no evidence this was happening. French intelligence was still assuming nine aircraft per squadron and the Air Ministry felt it had to do the same. This reduced the number of medium bombers to 927 aircraft and their total lift to 1,210 tons. It was also now



CHRIS GOSS COLLECTION

The Luftwaffe was officially established in the spring of 1935, and was much used thereafter for nationalistic pageantry, often incorporating large formations of aircraft, such as these Junkers Ju 52/3m **Behelfsbombers** *(auxiliary bombers) at a Nazi rally. The projection of military might was important to Hitler, and his attempts to promote the notion of German air superiority clearly worked.*

estimated that the Ju 87 squadrons possessed 135 aircraft, so this could only contribute 67 tons to the total bomb-lift. Both of these figures were in fact now underestimates of Luftwaffe strength, but this ought to have helped make the Air Ministry estimates more realistic. The initial Air Ministry reaction, however, was to try and find ways of compensating for the new German lower frontline strength by finding more German aircraft that could carry bombs. By including three Heinkel He 59 biplane floatplane squadrons, capable of carrying 36 tons of bombs, the Air Ministry was able to edge the total bomb-lift above 1,300 tons. Adding these was rather like adding Coastal Command's Vickers Vildebeest and Avro Anson squadrons to the RAF's total lift.

A REASONABLE MARGIN OF ERROR

Even more seriously, it was now realised that the range of German bombers had been substantially overestimated. The Air Ministry rather belatedly realised that no account had been taken of the need for a reasonable margin of error.[9] With recalculated radii of action, and assuming the bombers were flying at maximum cruising speed, the Do 17 — with a radius of action of 380 miles (610km) — could just about reach London; the Ju 86 — 415 miles (670km) — could manage it more comfortably, but even with half its bomb-load, the He 111 — 350 miles (560km) — could not.[10] Even these figures were, in the view of some, a little optimistic. Another estimate put the radius of action of the He 111 at just 316 miles (510km), but the higher figure was allowed to stand.[11]

Without the He 111, the bomb tonnage that could be dropped on London was halved. From bases in Germany, it was estimated that the He 111 could reach targets as far north as Scarborough, but would fall well short of the industrial Midlands. The Do 17 could get as far as Nottingham and the Ju 86 could almost reach Birmingham. In fact, the Air Ministry was still overestimating the range of German bombers. The Ju 86 could only just about reach London and the Do 17 fell well short, but these are the sort of errors that are unavoidable in assessments of this kind.

Other assumptions were more open to criticism. It was being assumed that the Ju 86 and Do 17 could carry their maximum bomb-load to the aircraft's maximum range. This was a dubious assumption. However, despite the growing doubts about the ability of the He 111 to reach London with a reduced bomb-load, the same assumption was now made for the Heinkel. Air Ministry analysis quite openly admitted that all the evidence suggested that the He 111 could carry only half its bomb-load —


CHRIS GOSS COLLECTION

ABOVE ***The Munich Agreement was signed by Germany, France, Italy and Britain on September 30, 1938, and by the summer of 1939 the Luftwaffe was arguably the most technologically advanced air force in the world, with 11 bomber wings prepared for combat, including KG 26, formed in May 1939 with He 111Fs, as seen here that year.***

2,200lb (1,000kg) — to its maximum range, but "from scientific analysis from known facts it is assessed that this aircraft should be able to take off in 1,000yd with full tanks and full bomb-load. 'Practical' evidence to the contrary has therefore been disregarded in the present assessment".[12]

This was a huge assumption. Furthermore, it was suggested that if the He 111 flew at its slowest possible cruising speed as it crossed the North Sea, this aircraft too could reach London.[13] Again, there was a determination to maximise the range and bomb-load of the Luftwaffe. Nobody, however, was making similar assumptions about British bombers.

SUPPORT, NOT ILLUMINATION . . .

The assumption that all the available German bombers could carry their maximum bomb-load to their maximum range led to some intriguing corollaries. The Air Ministry now concluded that it did not matter if the German bombers had to circumnavigate Belgium and the Netherlands. Flying over these countries, or even using captured airfields on the Channel coast, would not result in any increase in the weight of attack. From airfields on the Channel coast, German bombers would be able to attack targets further afield or perhaps fly more sorties, but they could not drop more bombs. They were already carrying their maximum bomb-load.[14]

Another analysis then took the logic one step further. If German bombers could carry the maximum bomb-load to their maximum range then surely by reducing the bomb-load they could fly even further.[15] Figures were produced which suggested that the He 111 might be able to reach any target in the UK with a 2,200lb (1,000kg) bomb-load. The Do 17 could do the same with a 550lb (250kg) bomb-load and the Ju 86 could reach nearly all targets in the UK with a 1,100lb (500kg) bomb-load.

There was always an argument for presenting the worst-case scenario, but things were getting out of hand. Moderate voices within the Air Ministry were trying to introduce some realism. The AOC-in-C of Bomber Command, Air Chief Marshal Edgar Ludlow-Hewitt, was explaining to anyone who would listen how tricky it was to maintain a bomber offensive across the North Sea, especially as the weather deteriorated with the approach of winter. There was no reason to suppose it would be any easier for German bombers flying in the opposite direction.

There was also very little reason to believe that Germany would even consider using its entire bomber force against Britain, especially given the Air Ministry's rather patronising views on German air strategy, which was considered to be rather backward by British standards. As the British saw it, the Luftwaffe was dominated by soldiers with little idea of how to use air power correctly. German generals would oppose strategic bombing and German commanders tasked with invading Czechoslovakia would not be satisfied with just the Stukas to support the German advance. A proportion of the medium bomber force would almost certainly have to be used tactically. The large number of airfields the Germans were known to be building on the former Austrian/Czechoslovakian border

TAH ARCHIVE

ABOVE ***In the wake of the Munich Agreement production of bombers for the RAF was ramped up. One of the more promising new designs was the Handley Page Hampden, which was fast, manœuvrable and could carry a bomb-load of 4,000lb (1,825kg). The Hampden bore the brunt of Bomber Command's early wartime raids over Germany.***

supported this thesis. A proportion of the German bomber effort would also have to be ready to strike at France. The idea that Germany would focus all bomber effort on Britain was considered "in the highest degree improbable".[16]

Taking everything into account, the threat to Britain might not be so great. One estimate, assuming that two-thirds of the Luftwaffe bomber force was used against Britain, downgraded the average number of sorties that could be flown each day from 600 to 300.[17] Another insisted that it was unlikely that more than half of the bombers attacking Britain could reach London or industrial targets in the Midlands.[18] Towns further east might suffer more heavily, but attacks on these were hardly likely to knock Britain out of the war.

THE SECOND DOSSIER

By September 1938, with the Sudetenland crisis reaching a head, the Chiefs of Staff were asked by the cabinet to review once more the military balance of power. It was a much briefer document. No mention was made of the new much-reduced bomb-lift figure the Luftwaffe was credited with. The Air Ministry was quite open about the doubts that were emerging. "We are still in considerable doubt as to the range and capacity of the bombers with which the German squadrons are now equipped", the report admitted.[19] However, in the case of the He 111, the possibilities ranged from the aircraft not being able to reach London to roaming the entire country with a ton of bombs. Indeed, despite all these doubts, the possible daily tonnage that could be dropped on Britain was now considered higher than it had been in the March dossier. The figure might be as high as 500–600 tons, rather than 400 tons, and this could be maintained for two months. "Only a proportion of this weight could be directed against London and the principal industrial centres", the report cautiously continued, but there was no attempt to estimate what this proportion might be.

Germany's potential need to use some of its bomber force against Czechoslovakia and France, plus the weather conditions prevalent in the North Sea, all made it "extremely unlikely that anything like this scale of attack would be maintained against vulnerable points in this country". Nevertheless, the Air Ministry was still claiming that the Luftwaffe might be able to deliver up to 600 tons a day. Other commitments and circumstances may prevent the Luftwaffe from doing this immediately, but the Air Ministry was making it clear that with Czechoslovakia defeated, and some reasonable weather, this was what Britain may have to face.

How could the RAF respond? During the summer months of 1938 the re-equipment of Bomber Command had continued apace. By late September the number of squadrons the Air Ministry was willing to count had increased from 35 to 42. These were 32 medium bomber squadrons (13 Battle, 16 Blenheim and three Wellesley) and ten heavy bomber units (five Whitley and five Harrow). Another four squadrons were converting to the Battle and one to the Blenheim.[20] However, the comparable bomb tonnage these could deliver was '"less

than 100 tons" a day. The French would add a further 200. Rightly, the French were criticised for their disorganised efforts at rearmament, but nobody seems to have wondered why, if this was the case, the French bomber force had twice the striking power of the RAF.

It seems that the comparable "less than 100 tons" figure employed the Bomber Command criteria that a squadron would be able to fly 27 sorties in the first week and then sustain 18 sorties a week thereafter. Only the 42 "mobilisable" squadrons were counted, and, using the lower bomb-load figures for the Wellesley, Whitley and Harrow, Bomber Command could deliver 81 tons a day in the first week and then maintain 54 tons a day thereafter. However, if the same criteria had been applied to the German bomber force, even if the entire force was turned on Britain, the Luftwaffe would be able to deliver 378 tons a day in the first week and then maintain just 252 tons a day, not up to 600 tons a day.

The clear message from the Air Staff was that Germany's bomber capability was "considerably greater" and that Britain should avoid war if possible. Using the standard 50 casualties per ton of bombs dropped (a figure based on a selective average of First World War casualties), there would be 1·2 million casualties in the first two months of war. The German aerial threat was as exaggerated as the threat Saddam Hussein posed 65 years later.

THE INEVITABILITY OF WAR

Would it have made any difference if Chamberlain had had the true facts? Probably not. Chamberlain was as anxious to avoid war as Blair was convinced it was necessary. Nevertheless, with a more realistic assessment of the relative strengths of the two air forces, Chamberlain might have entered the negotiations with a little more confidence.

Some may argue that it all turned out for the best. The standard defence for the Munich Agreement, in which Hitler was granted his wish to annex the Sudetenland, is that it bought the British more time to re-arm. Initially, however, the Air Staff and government planned on using the time gained to prepare for the bomber war they were still expecting. As it turned out, the truly decisive battles of the inevitable war that was to break out a year later were to be fought on the ground at Sedan, El Alamein, Stalingrad, Kursk and Normandy, and not in the skies over French, British, Soviet and German cities.

After Munich, the Air Staff continued to prepare for the wrong war. However, in March 1939, there was a change of policy and Britain began laying the foundations for the Army that would eventually defeat the *Wehrmacht*. The Munich Agreement at least allowed this process to get under way.

> **"This picture of air destruction was so exaggerated that it depressed the Statesmen responsible for the pre-war policy, and played a definite part [in] the desertion of Czechoslovakia in August 1938 . . ."**
>
> *Prime Minister Winston Churchill to Chief of the Air Staff Air Chief Marshal Charles Portal, October 7, 1941*

In 2003 the British government had decided to go to war and was looking for evidence to support the decision. In 1938 the government did not want to go to war and welcomed any evidence that supported that decision. In both cases the vital justifying evidence provided was decidedly "dodgy".

GREG BAUGHEN** is the author of* The Rise of the Bomber *(Fonthill Media), the second volume in his series on the history of British air power. For more info visit **www.facebook.com/gregbaughen

1 Hansard, November 10, 1932
2 Hooton, E.J, *Phoenix Triumphant — The Rise & Fall of the Luftwaffe* (Arms & Armour, 1994), pp167–168
3 The National Archives (TNA) ref AIR 9/90, August 24, 1938
4 TNA ref AIR 40/2118, July 1938
5 TNA ref AIR 41/39, p235
6 TNA ref CAB 24/278, September 14, 1938
7 TNA ref CAB 53/37, March 16, 1938
8 TNA ref AIR 14/774, March 14, 1940
9 TNA ref AIR 40/2118, July 1938; AIR 9/90, August 25, 1938
10 TNA ref AIR 9/90, August 24, 1938
11 TNA ref AIR 40/2118, September 15, 1938
12 TNA ref AIR 9/90, August 29, 1938
13 TNA ref AIR 9/90, August 23, 1938
14 TNA ref AIR 9/90, August 3, 1938
15 TNA ref AIR 40/211815, September 1938
16 TNA ref AIR 9/90, September 12, 1938
17 TNA ref AIR 9/90, August 29, 1938
18 TNA ref AIR 9/90, September 12, 1938
19 TNA ref CAB 24/278, op cit
20 TNA ref AIR 41/39,op cit


AIRFRAME DETAIL No5
NEW
Fifth in Series
The Boulton Paul
Defiant
by
Richard A. Franks
Historical photographs and detail images of the world's only complete preserved Defiant
Period detail images during production and service use
Data from flight manuals and spare parts catalogues
Colour profiles and concise camouflage and marking notes by Richard J. Caruana
Lists of Defiant kits, accessories, masks and decals produced in all scales
Kit build of the new-tooled 1/48th Defiant from Airfix by Steve Evans
96 pages
The Boulton Paul
Defiant
A Technical Guide
Order today – only £13.95! plus p&p
www.valiant-wings.co.uk
+44 (0)1234 273434 valiant-wings@btconnect.com
OUT NOW
VALIANT
WINGS PUBLISHING


Fighter Leaders Series
6 volumes available
totalling 310 bios, 600 photos, over 50 profiles...
The must-have Who's Who guides!!
www.RAF-IN-COMBAT.com

THE

VISCOUNT

COMES TO AMERICA

PART TWO: CONTINENTAL AIRLINES

Continuing his series on the only three American airlines to purchase the Vickers Viscount turboprop airliner direct from the British manufacturer, **DAVID H. STRINGER** focuses on Continental Airlines, which, under the dynamic leadership of Bob Six, used the state-of-the-art 810-series variant of the stylish propliner to establish a highly successful route network

OF THE TRIO of American airlines that ordered the Viscount direct from Vickers, Continental is the only one that paid for its order in full and did not face foreclosure of its jet-prop fleet from the manufacturer.

In 1950s America, Continental Airlines was truly a success story. Despite being subject to the strict and sometimes unfair oversight of the Civil Aeronautics Board (CAB), as all scheduled airlines in the country were, the company managed to transform itself during the decade to become the envy of the industry.

Continental's growth and prosperity was due primarily to the focused leadership of Bob Six, the company's president. In a regulated industry in which each carrier had to charge the same fare on a route, Six knew that offering the best service possible was the only card that a carrier had to play in order to beat the competition. He was a perfectionist who treated his staff well and expected the most from them in return. It also helped that he had cultivated relationships with a wide range of well-connected friends who would be instrumental in making things happen for him and for Continental Airlines.

TAKE SIX

Robert Forman Six was born into a prominent family in Stockton, California, on June 25, 1907. As a young man, he began to meet and befriend influential people, including Walter Beech, from whom he bought his first aircraft. During a year's stay in China, to which he travelled in the mid-1930s to work for the China National Aviation Corporation (CNAC), Six flew as copilot for Jimmy Doolittle, another gent who would distinguish himself in the field of aviation and maintain his friendship with Six.

Bob Six entered San Francisco's *"beau monde"* when he married a divorcée named Henriette Erhart Ruggles, daughter of the chairman of pharmaceutical company Charles Pfizer & Co. His social connections in the City by the Bay led to an introduction to Thomas Fortune Ryan III, the namesake of a "Gilded-Age" tycoon grandfather who had amassed wealth through investments in the streetcar, tobacco and insurance industries. Ryan's love was aviation. He had saved the Lockheed Aircraft Company with his investment in 1932, and he earned the distinction of being one of the seven paying customers aboard Pan American's first passenger-carrying transpacific flight, on October 21, 1936. He had also purchased Hanford Airlines, a Midwest carrier that he would revitalise and rename Mid-Continent Airlines.

Six told Ryan that he, too, was interested in investing in an airline, and Ryan introduced him to Louis Mueller, business partner of the famous pioneer aviator, Walter T. Varney. The latter's fourth and final airline creation, Varney Speed Lines Southwest (later simply Varney Air Transport), had won the contract to carry airmail between El Paso, Texas and Pueblo, Colorado via Albuquerque and other points. It was essentially an airmail route from nowhere to nowhere via nowhere. Varney was ready to bale out of the company, which needed money and management. Mueller recruited Six to supply both.

In 1937 Six was elected executive vice-president of the company, service was extended northward from Pueblo to Denver, and the name of the modest operation was changed to Continental Air Lines, Inc ("Airlines" from 1958). The company's corporate headquarters was relocated from El Paso to Denver and Six attained presidency of the firm in 1938. From then on, it was his company.

The airline received its Certificate of Public Convenience & Necessity from the newly-established Civil Aeronautics Authority (forerunner of the CAB), formed in 1938. This validated Continental as part of the nexus of scheduled airlines, on a par with TWA, United, American and others, that would form the trunk airline network of the USA.

OPPOSITE PAGE ***Gleaming in its newly-applied Continental Airlines scheme, factory-fresh Viscount V.812 N248V (c/n 360) attracts the attention of press and public alike at the SBAC show at Farnborough in 1958.*** **ABOVE** ***The visionary who built Continental into one of the USA's most successful airlines, Robert F. Six.*** N248V PIC VIA JON PROCTOR

PETER KEATING © A FLYING HISTORY LTD

ABOVE ***Douglas DC-6B N90961 was delivered to Continental in January 1955, although it was actually operated and maintained by United Air Lines — note the dual markings on the fin — to fulfil interchange (through-flight) arrangements between the two airlines. Another DC-6B was used for a similar arrangement with American Airlines.***

Continental grew, but not to the extent of the larger trunk carriers. Instead of offering routes from Denver to San Francisco, Chicago or New York, the CAB blessed Continental with network extensions such as Pueblo—Wichita via La Junta in Colorado and Garden City, Dodge City and Hutchinson in Kansas. The "Las Vegas" on Continental's route map was in New Mexico — not the more famous "Sin City" in Nevada.

Bob Six's personal life changed in September 1951, when his friend, Leland Hayward, founder and chairman of Southwest Airways (later renamed Pacific Air Lines), invited Six to dinner in New York. Hayward was also a theatrical agent, Broadway producer and the former husband of actress Margaret Sullavan. The occasion was the first anniversary of the long-running Broadway play, *Call Me Madam*, which Hayward had produced. At the dinner, Six met the star of the show, Ethel Merman. He divorced Henriette in 1952 and married the famous Broadway belter in Mexicali, Mexico, in March 1953. Six, who had the reputation of being a "character", and his bride, famous for her feisty personality, became the talk of the town among Denver's smart set.

THE DENVER SERVICE CASE

By 1955 Continental's route system still looked like that of a local service airline. The fleet consisted of twin-engined Douglas DC-3s and Convair 340s. The company also owned and leased a few Douglas DC-6s and -6Bs, which it operated in conjunction with American Airlines and United Air Lines on interchange services (through-flights operating over the connecting routes of two or more carriers). But the longest non-stop hauls over Continental's own system were Denver—Kansas City (559 miles/900km), El Paso—San Antonio (498 miles/800km) and Denver—Wichita (439 miles/705km).

In 1955 Continental acquired a financially-troubled local service carrier named Pioneer Air Lines, which added more "tumbleweed towns" to Continental's route map (Snyder, Sweetwater, and Mineral Wells, Texas, to name a few). But Six knew what he was doing. The Pioneer merger also gave Continental entry into the important Texas cities of Dallas, Austin and Amarillo.

The CAB had been reluctant to award long-distance routes to Continental out of concern that the company would not be able to operate them. "Able" was one of the three conditions required of any airline by the CAB before a route would be awarded — the company had to be "fit, willing and able". Six's airline was profitable but there was concern that he would not be able to afford all of the expenses involved — equipment, facilities, employees etc — in inaugurating long-sector routes to major new markets.

But Six knew the right people. He had been introduced to Robert Lehman, of Lehman Brothers, back in the late 1930s when the finance company floated the original issue of Continental stock. Fred Ehrman, a Lehman Brothers partner, was placed on Continental's Board of Directors, and Ehrman linked Six up with his friends at The Chase Manhattan Bank. As long as Six ran Continental as well as he did, he had no problem accessing large infusions of cash whenever he needed them.

TAH ARCHIVE

ABOVE ***Bob Six (left) and George Edwards, Managing Director of Vickers-Armstrongs Aircraft Division, pose for a publicity photograph during the Continental Airlines President's visit to the UK in 1955 to discuss the acquisition of 15 examples of the manufacturer's Dart 525-powered 810-series Viscount, virtually "off the drawing board".***

Taking a chance on Six and Continental, the CAB shocked the airline industry when it released its opinion (and subsequent award) in the Denver Service Case late in 1955. While authority was given, with restrictions attached, for TWA to serve Denver and for United Air Lines to serve Kansas City, Continental was granted permission to serve a route from Chicago to Los Angeles via Kansas City and Denver. Non-stop authority between any of the four cities, including between Chicago and Los Angeles, was included. Two of the CAB's five members (Chan Gurney and Harmar Denny Jr) voted against Continental, stating that the oversized regional carrier would spiral into debt trying to compete with the big airlines on these major new routes and, thus, the subsidy bill for serving smaller cities would increase as the airline lost money on its new long-distance services. Bob Six would prove them wrong.

Six's first order of business was to acquire suitable aircraft for the new route. And Bob Six always did things in a big way. His first order was for five Douglas DC-7Bs, to be delivered in 1957. In what was an unusual move, the big piston-propliners were to be outfitted in a well-appointed all-coach configuration.

THE JOY OF SIX

The next choice for Continental was the Viscount, but not the 700 Series operated by Capital Airlines in the eastern USA (see *The Viscount Comes to America, Part 1* in *TAH24)*. Six's evaluation team selected the 810 Series, with more powerful Rolls-Royce Dart 525 engines and greater seating capacity. Continental's Viscount V.812s, ordered in December 1955, would be outfitted in a 52-passenger + four-seat rear lounge all-first-class configuration, with deliveries slated for 1958.

Finally, to operate the non-stop service between Chicago and Los Angeles, the company selected Boeing's 707, America's first commercial jetliner and an aircraft that most in the industry thought Continental was too small to operate. The four 707s, with both first-class and coach cabins, were scheduled to join the fleet in 1959.

Industry analysts simply didn't believe that

The first of Continental's 15 V.812s was N240V (c/n 353), which made its maiden flight on February 14, 1958, and was delivered to the airline that May, named **Los Angeles*****. It was sold to the Tennessee Gas Transmission Corp in August 1960. Artwork by JUANITA FRANZI / AERO ILLUSTRATIONS © 2018***

BAE SYSTEMS x 4

ABOVE ***All 15 of Continental's V.812s were built on the production line at Weybridge, as seen here in the spring of 1958. The greater power of the Dart 525 fitted to the 810-series meant that the airframe had to be strengthened, with more structure in the wings and a beefing-up of the fuselage, tail and flying controls to absorb the extra power.***

ABOVE ***Continental made sure its customers knew its V.812s were radar-equipped, with a stylish legend on the port door*** **(LEFT)*****; the AVQ-10 weather radar dish was housed in a tidy fairing in the nosecone, designed for easy maintenance*** **(RIGHT). BELOW** ***A pair of Continental V.812s beside the hangar at Wisley, where they were tested.***

Arguably one of the most attractive Viscount colour schemes, Continental's three-colour (plus bare-metal) palette complemented the type's graceful lines, a rather raffish touch being added with the incorporation of a dark blue band around the cockpit, lending the impression the aircraft was wearing a pair of elegant sunglasses! Continental Viscount II N248V is seen here up from Farnborough during the 1958 SBAC show.
TAH ARCHIVE

RIGHT ***Jet power! Continental was keen to differentiate its V.812s from Capital's 700-series Viscounts, each bearing the legend "Viscount II" prominently on its fin.***

BAE SYSTEMS

Continental could afford to pull off such a massive expansion. But if Six was worried, he didn't show it. Continental had recorded a profit every single year since 1941. He told employees that these were "the airline's greatest years", and stated that Continental was "not the largest — but the best".

The total bill for five DC-7Bs, 15 Viscounts and four 707s — 24 aircraft in all — was a jaw-dropping \$64·3m; some \$50m more than the company's total net worth. Once again, Six's friends at Chase Manhattan stepped forward to bankroll the transactions. Sir George Edwards, Vickers-Armstrongs Aircraft Division's Managing Director, became friends with Six and offered Continental invaluable assistance in financing the Viscount purchase.

The DC-7Bs inaugurated services over the new routes to Chicago and Los Angeles. Continental's 1956 Annual Report announced that "on April 28, 1957, Continental will inaugurate the finest and most luxurious 'Club Coach' service available between Chicago, Denver and Los Angeles. The service will be extended to Kansas City early in July 1957". It continued: "The cabins of these Continental Club Coaches will be compartmentalised and have stag smoker lounges in addition to spacious five-seat lounges. The cabin interiors will be fabulously finished and upholstered in soft, warm colors. The new low-cost fare service will feature reserved seats and, at the option of the passenger, refreshing cocktails and hot 'Country Club' meals, with choice of four entrées, served at moderate extra cost".

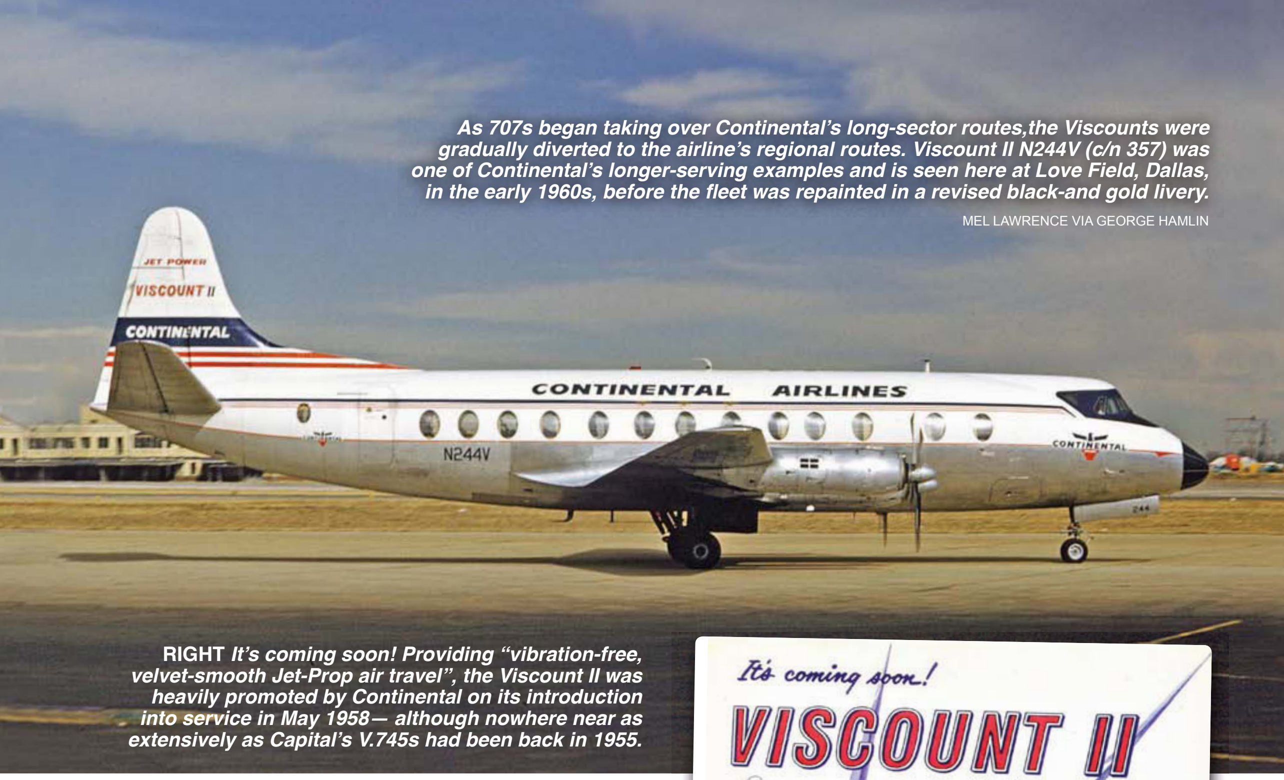
Before this, no airline's coach service within the USA had been so elaborate. Two-by-two seating was offered on the DC-7Bs. The idea was to treat coach passengers better than they had ever been treated before, so that they would fill up the new aircraft and the company would make money on a high volume of low fares.

In answer to Gurney and Denny, his critics at the CAB, Six voluntarily removed Continental from the government subsidy programme, which compensated the company for serving smaller cities, on the day that service was inaugurated over the new Chicago—Los Angeles route. This was the first time that an airline had declared that it no longer needed "free" government money for

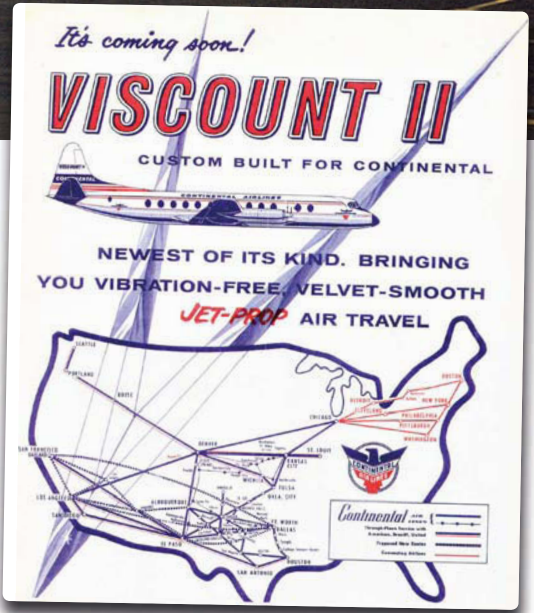
ABOVE ***Continental's V.812s were initially configured in an all-first-class 52-passenger layout with an ingeniously designed interior with specially commissioned trim and décor, which provided the airline's Viscounts with an extra 4in (10cm) in width.*** UNITED AIRLINES ARCHIVE

LEFT ***"How long since you've been hailed as a conquering hero?" Thus runs the copy in this classic 1959 Continental advertisement for its Viscount and DC-7B "Gold Carpet" service. "You're always a Caesar to us. Unless, of course, you're Cleopatra!"*** AUTHOR'S COLLECTION

BELOW ***A Continental stewardess leads passengers down the integral airstairs of Viscount II N241V, named* Chicago*, and on to the specially prepared gold carpet and velvet rope at Los Angeles in May 1959. Within a few years, the Viscounts were superseded on Continental's long-haul sectors by 707s, and this aircraft was sold to Australian airline Ansett-ANA in 1960.***
MEL LAWRENCE VIA GEORGE HAMLIN



As 707s began taking over Continental's long-sector routes,the Viscounts were gradually diverted to the airline's regional routes. Viscount II N244V (c/n 357) was one of Continental's longer-serving examples and is seen here at Love Field, Dallas, in the early 1960s, before the fleet was repainted in a revised black-and gold livery.
MEL LAWRENCE VIA GEORGE HAMLIN



RIGHT *It's coming soon! Providing "vibration-free, velvet-smooth Jet-Prop air travel", the Viscount II was heavily promoted by Continental on its introduction into service in May 1958— although nowhere near as extensively as Capital's V.745s had been back in 1955.*

AUTHOR'S COLLECTION

providing "public service" flights. Six was certain that revenue from his new mainline services would more than compensate for losses on the DC-3 "prairie-hopper" routes, thus making the company self-sufficient, without the need for federal aid. Both the CAB and the US Congress, which watched over subsidy expenses, were thrilled. The CAB went so far as to state that "[t]he carrier is to be commended for taking the initiative at this time in proposing to conduct its future operations without subsidy support". So it is perhaps ironic that by 1963, the CAB had transferred all of Continental's small cities in Texas, New Mexico and Kansas to local service carriers, which still required subsidy to serve them.

Continental did so well in its first year of operation over the Chicago—Kansas City—Denver—Los Angeles route with its all-coach DC-7Bs that, by March 1958, some 28 per cent of its system-wide passenger revenues were derived from this service. Now it was time to introduce a "First Class" product into the market.

PRESENTING . . . THE VISCOUNT II

By May 1958 Capital Airlines had been operating Viscounts in the eastern part of the USA for nearly three years. These were still the only turboprop-powered ("jet-prop") airliners operating domestically, and the type continued to draw a lot of attention as it was at that time the most technologically modern aircraft in service in the USA.

Bob Six wanted Viscounts too, and he knew that they were only going to be the queens of his fleet for one year until the 707 jetliners arrived. But that was enough time for him to prove that Continental could offer the finest first-class product in this competitive marketplace.

Continental needed a more powerful aircraft than the V.745 model operated by Capital. Six's airline was based in Denver, "The Mile-High City", and just west of town was the face of the Rocky Mountains. Hot desert and mountainous terrain were both part of the geography encountered on a daily basis by the company's airliners. Accordingly, Continental became the launch customer for the advanced 810-series, equipped with four 1,910 e.h.p. Rolls-Royce R.Da 7/Mk 525 engines, permitting a cruising speed of 365 m.p.h. (587km/h). Continental's 1957 Annual Report stated that "[t]hese engines are scheduled to be replaced in 1959 with Rolls-Royce R.Da 11 [sic] jet-prop engines, which

Proudly wearing Continental's new black-and-gold livery, originally introduced by the airline's 707s on their entry into service in the summer of 1959, N246V (c/n 359) is prepared for a flight at Los Angeles. The Viscounts did not immediately have the new scheme applied, but were gradually repainted, some retaining the original red and blue scheme well into 1961–62.

JON PROCTOR COLLECTION

will enable the aircraft to cruise at 400 m.p.h. [644km/h]". In the event, this did not happen.

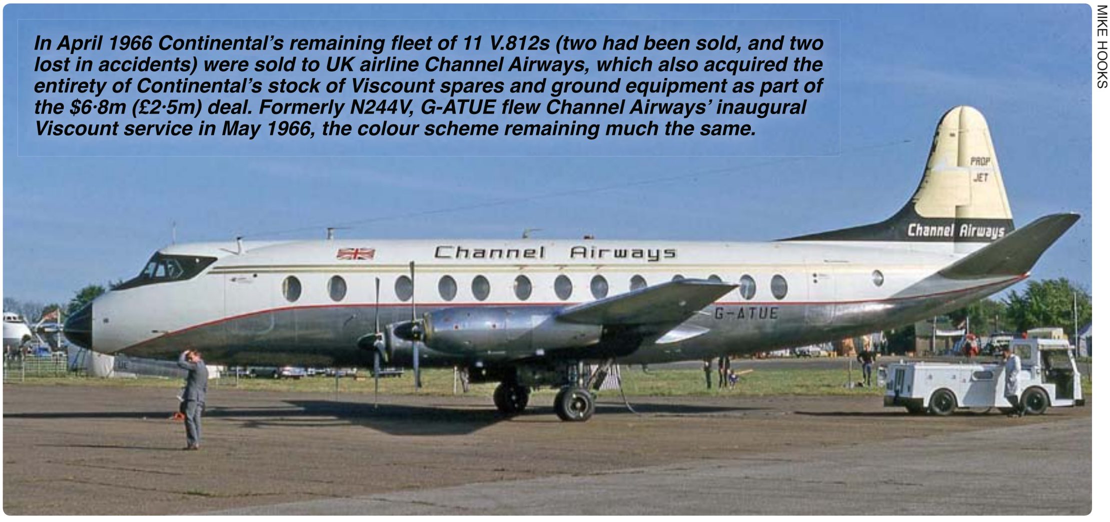
In a 1957 letter to Continental employees, Tom Gammon, Deputy Managing Director of Vickers-Armstrongs Aircraft Division, stated that the Viscount designed for Continental "will have more speed, more range and more capacity than its predecessors. Such built-in features as nose radar, 'air-steps', club lounge and the new and attractive interior design specified for Continental's 'Golden Arrow' Viscount will further enhance its competitive appeal to the American air-travelling public".

The "Golden Arrow" reference was an indication of the direction in which Six wanted to take the airline's image, with the help of Continental's advertising agency, J. Walter Thompson (JWT). The DC-7B Club Coaches introduced boarding via a gold carpet and golden staircases. Now the Viscounts would feature gold carpet onboard, gold furnishings and even gold-coloured Dirilyte silverware for meal services. Baked potatoes accompanying steaks served in-flight were to be wrapped in gold foil, golden champagne would be served and female passengers would receive golden carnations. The Golden Arrow billing was rechristened "Gold Carpet Service" before Viscount operations began.

To emphasise the enhanced quality of Continental's jet-props over those of other carriers, the airline referred to its product as the Viscount II, the "fastest airliner in America", and the company referred to itself as "First in the West with jet-power flights!". With interiors designed by Charles Butler & Associates, the turboprops were equipped with 52 first-class seats in two-by-two rows. Continental also had a four-seat lounge installed at the rear of the aircraft in a section

BELOW *In early 1958 the CAB awarded Continental authority for some 2,800 miles (4,500km) of new non-stop routes in Texas and New Mexico, bringing Viscount services to many towns in both states, including Dallas, where Viscount IIs N246V and N253V are seen here, with the distinctive Braniff hangar at Love Field in the background.*

MEL LAWRENCE VIA GEORGE HAMLIN



MIKE HOOKS

In April 1966 Continental's remaining fleet of 11 V.812s (two had been sold, and two lost in accidents) were sold to UK airline Channel Airways, which also acquired the entirety of Continental's stock of Viscount spares and ground equipment as part of the $6·8m (£2·5m) deal. Formerly N244V, G-ATUE flew Channel Airways' inaugural Viscount service in May 1966, the colour scheme remaining much the same.

usually occupied by a freight compartment on other 810-series variants. The total price for the 15 V.812s, including spare parts and ground handling equipment, came to $25,806,864. From February to August 1958 two Viscounts were leased to Continental — V.744 N7403 from Capital and V.745D G-ABPH from Vickers — for pilot training and route-proving duties.

Ethel Merman christened the first Viscount II and the British birds entered scheduled service with Continental on May 28, 1958, ready to introduce the airline's version of first class to the public. Initial Viscount II flights operated routes Chicago—Denver—LA, Chicago—Kansas City—Denver—LA and Chicago—Kansas City—Colorado Springs—Denver—LA. Continental's marketing, and its growing reputation for superb in-flight service, drew passengers so effectively that, after four months of Viscount operations, the airline had captured more than 43 per cent of the first-class market on flights from Denver to both LA and Chicago, and some 30 per cent of the first-class passengers on the Kansas City—LA sector.

INTO THE PURE JET AGE

As more Viscount IIs joined Continental's fleet, service was expanded into secondary markets, bringing jet-prop service to cities in Texas, New Mexico, Oklahoma and Kansas. After Continental's 707s entered service on June 8, 1959, the Viscounts spread even further across the system, replacing the company's remaining Convairliner flights and bringing four-engined turboprop services to cities such as Hutchinson, Kansas and Alamogordo, New Mexico.

The 707s brought with them an expansion of the "gold" theme that Six and JWT were promoting. It was decided to paint the fins of the aircraft gold and advertise the new airliners as "the jet with the golden tail". Shortly thereafter, an entirely new livery featuring gold cheatlines on the fuselage, along with gold and black on the fin, was introduced for Continental's jets. The traditional red, white and blue eagle logo was now transformed into black, white and gold.

This was carried over to the Viscounts, which also received a new black-and-gold livery, replete with the words "Jet Power Viscount II" on their fins. By 1961 the Viscounts' interiors were reconfigured with both first-class and coach cabins, and the British turboprops were the backbone of the airline, operating about half of all of the company's schedules. Continental continued to make money hand over fist, reporting profits every year with the exception of 1958, its first fiscal year without receiving a federal subsidy.

The Douglas DC-9 jetliner made its debut in Continental's timetable on April 10, 1966. The new short/medium-haul turbofan-powered jets were purchased to replace the Viscounts, the last of which flew its final service for Continental on May 22, 1967. After the introduction of the DC-9s, the company's 11 remaining Viscounts were sold to Channel Airways in the UK, which retained Continental's gold-and-black theme, as it conveniently fitted in with the former's previously-adopted "Golden Viscount" scheme.

The Viscounts had served Continental Airlines well, performing with aplomb the tasks for which they had been acquired; introducing first-class service on the company's new competitive trunk routes, then serving as the standard aircraft of the fleet on services not covered by mainline jets.

As for Bob Six, he divorced Ethel Merman in 1960, and the following year married television actress Audrey Meadows, star of Jackie Gleason's show *The Honeymooners*. Meadows was a much better match for Six. They seemed to be the perfect couple and stayed together until his death in 1986.

NEXT TIME *The author concludes the series with the third and final American airline to order the Viscount direct from Vickers — Boston-based Northeast Airlines*

THE SOVIET SAM-JAMMER

THE YAKOVLEV YAK-28PP *BREWER-E* IN SOVIET UNION & UKRAINIAN SERVICE, 1970–94

By the mid-1960s the West's surface-to-air missile technology was rapidly outstripping the Soviet Union's ability to offer an effective platform with which to counter it; enter the Yakovlev Yak-28PP, a dedicated electronic warfare variant of the Yak-28 strike bomber. **BABAK TAGHVAEE** chronicles the development and career of this purposeful-looking and little-known — but long-serving — piece of specialist kit

GENNADY PETROV COLLECTION

DEVELOPED FROM the Yakovlev Yak-28 twin-jet-engined supersonic bomber (Nato reporting name *Brewer*) as a dedicated electronic warfare (EW) aircraft, the Yak-28PP *Brewer-E* formed the backbone of the EW force of the *Voyenno-Vozdushnye Sily* (V-VS — Soviet Air Force), with some 84 examples ultimately operating with five V-VS Independent Reconnaissance Aviation Regiments within the Soviet Union and abroad throughout the 1970s and 1980s. In 1983 the Sukhoi Su-24MP *Fencer-F* EW platform was introduced into service to replace the Yak-28PP, but the latter continued to serve alongside the Su-24MP until it was finally withdrawn from V-VS and *Zbroyni Sily Ukrainy* (ZSU — Ukrainian Air Force) service in 1993 and 1994 respectively.

GENESIS OF THE PP

The design and development in the late 1950s and early 1960s of advanced American surface-to-air missile (SAM) systems such as the MIM-23 Hawk I and MIM-14 Nike Hercules significantly reduced the combat capabilities of the V-VS's front-line strike-bomber units, which were then equipped only with non-precision-guided weapons. The use of free-fall bombs, cluster munitions, rockets and 20–30mm guns made it necessary for V-VS bomber pilots to fly at medium altitude to stand any chance of hitting their targets accurately, making them highly vulnerable to the target-detection radars of enemy SAMs.

To address this, Soviet aircraft designers set about developing a comparatively light EW aircraft, roughly equivalent to the USAF's Douglas EB-66 Destroyer, then demonstrating its efficiency in jamming SAM radars over North Vietnam. Electronic warfare variants of the Tupolev Tu-16 (*Badger-A* and *-H)* and Tu-22 (*Blinder-E)* bombers had been developed by the Soviets, but these lacked the manœuvrability to undertake EW escort duties for front-line tactical bombers. The readily available Ilyushin Il-28REB *Beagle* EW variant, equipped with wingtip ECM pods, was too slow and obsolete. Much as the Americans had chosen the B-66 medium bomber

OPPOSITE PAGE ***Yak-28PP "White 53" of the 118th OAPREB, a specialised electronic warfare unit of the V-VS, was captured above the clouds by Ukrainian aviation journalist and photographer the late Sergei Skrynnikov in 1991.***
ABOVE ***Yak-28Ps and Ls on the production line in 1967 at Irkutsk, Siberia, where Yak-28PPs were later produced.***

GENNADY PETROV COLLECTION

ABOVE ***The Yak-28 was a development of the Yak-27, initially designed as an interceptor, but also modified to become the Yak-27R tactical-reconniassance aircraft, an example of which is seen here. The Yak-27's mid-mounted wing was enlarged and moved up to the shoulder position on the Yak-28, which first flew in March 1958.***

as the base platform from which to develop the EB-66, so the Soviets selected the Yak-28, which had been developed into the Yak-28R *Brewer-D* tactical-reconnaissance variant in 1963, as the template for the new EW aircraft.

Accordingly, in 1965, designer V.A. Babayan was appointed to lead the engineering group tasked with developing the new Yak-28 variant, and was supplied with a set of drawings and documents relating to the series production of the Yak-28R at *Zavod* (Aircraft Factory) No 39 at Irkutsk in eastern Siberia. During 1966–67 Babayan worked with Yakovlev's deputy chief designer, V.A. Zabor, and his deputy, O.A. Chlyants, on the design of what would become the Yak-28PP.

FIRST FLIGHT

The prototype Yak-28PP was based on the Yak-28I *Brewer-C*, the main production tactical bomber version, with the cockpit glazing arrangement of the Yak-28R reconnaissance variant, incorporating left and right elliptical panes meeting at a knife-edge. Test pilot A.L. Kolosov and navigator N.V. Dolzhenkov were responsible for the first test flights of the prototype, which began in 1967, and which proceeded with no problems. The Yak-28PP's performance and flight characteristics were essentially the same as those of the Yak-28I, making conversion from the latter quick and easy.

The V-VS began taking delivery of the first Yak-28PPs in 1968, the variant being produced in parallel with bomber versions on the production line. During the last stage of assembly the EW variants were sent to a separate section of the factory to equip the aircraft with its specialised systems. In total, 84 Yak-28PPs were built during 1967–71. The aircraft successfully completed its state tests in 1970, with the result that its designers, test teams and production workers were nominated for a state prize.

The Yak-28PP had no capability to carry bombs, the relevant systems having been deleted to provide space for the installation of three types of ECM suite: *Bouquet* for group/escort protection; *Lilac* for self-protection and *Fasol-1* for the suppression of enemy radar for both group and self-protection. *Bouquet* could accommodate various ECM systems, including SPS-22 (for the

The Yak-28PP was essentially equivalent to the USAF's development of the Douglas B-66 Destroyer into the EB-66 electronic-warfare specialist platform, which proved invaluable in Vietnam. This EB-66 of the 41st Tactical Electronic Warfare Squadron awaits minor repairs at Takhli, Thailand, in May 1968.

JERRY CUSTIN VIA WARREN THOMPSON

SERGEI POPUSEVICH VIA AUTHOR

ABOVE ***Showing the type's distinctive*** **velosipedno** ***(bicycle) undercarriage arrangement with wingtip stabilisers, a 118th OAPREB Yak-28PP prepares to land at Chortkov in Ukraine in the mid-1980s, when most of the V-VS's fleet of*** **Brewer-Es** ***was still bare-metal. Note the chaff-dispensing rocket-projectile pods on the outer wing sections.***

22–30cm frequency band), SPS-33 (12·5–22cm), SPS-44 (10–12·5cm) and SPS-55 (8–10cm), and was designed for strike-group protection, in which a group of tactical bombers would be protected from detection by SAM systems and enemy interceptors' radar-guided air-to-air missiles (AAMs) by up to three Yak-28PPs. (SPS = *Stahntsiya Pomekhovykh Signahlov* — interference emitter or active jammer.)

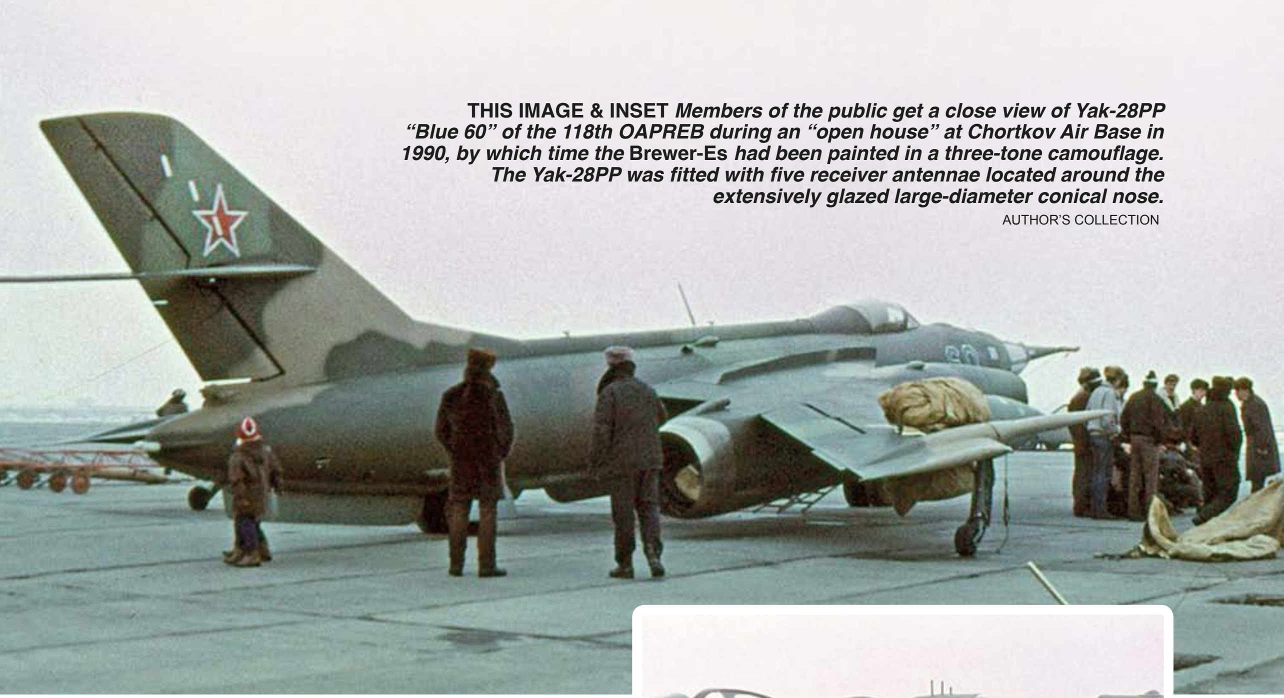
Depending on the capabilities of the enemy SAMs' early-warning, search-and-detection, target-track and illumination radar equipment in the battle zone, several Yak-28PPs could carry various *Bouquet* combinations in order to cover all necessary frequency bands simultaneously. For example, to protect a formation of front-line bombers in an area under the extensive radar coverage of different SAM systems, one Yak-28PP in the strike formation could carry the SPS-22 and SPS-33 systems while a second Yak-28PP was equipped with the SPS-44 system; a third was fitted with the SPS-55 system. In this way, the three Yak-28PPs created a battle formation to protect the bombers from all electronic aspects.

For the late 1960s the SPS system was an exceptional piece of equipment, meeting all the requirements for both energy and operational characteristics. By the beginning of the 1970s, however, Nato radar equipment had advanced considerably, with improved frequency-hopping characteristics and other modifications. The 1980s saw the introduction of phased-array radars, further limiting the effectiveness of the Soviet Union's SPS systems.

To accommodate the various ECM systems, the Yak-28PP incorporated, in place of the bomb bay, a retractable module which could be lowered and dismantled for maintenance and inspection. The module could carry both the *Fasol-1* and *Bouquet* systems, with their antennæ housed within a fairing in the underside of the module, making the Yak-28PP visually distinctive from the *Brewer-C* bomber. To regulate the temperature of the module, three ventral air intakes, comprising two heat exchangers and one ram-air intake, were incorporated on the underside of the fuselage a few inches forward of the module. The two antennæ for the SPS-5-28 ECM suite were installed on the undersides of each of the two nacelles housing the Tumansky R-11AF2-300 turbojet engines. The SPS-5 system was not automatic and had to be operated manually by the pilot or navigator during the flight (it was turned on after take-off and turned off before landing).

The Yak-28PP was also equipped with a special type of passive jamming system, comprising two UB-16-57UM rocket-projectile (RP) pods on BD3-60-21UM pylons mounted near the wingtip undercarriage stabilisers, carrying 16 x S-5P chaff-dispenser RPs. These would be launched ahead of the aircraft to deploy a cloud of aluminium-foil strips, creating a false radar echo to fool the enemy's radar-guided missiles. To protect the aircraft from infra-red guided missiles, the aircraft was also fitted with the Avtomat-2I flare-launcher system, which enabled the manual or automatic deployment of 26mm (1in) magnesium flares from a pair of KDS-19 cassettes mounted on the undersides of the engine nacelles.

To detect incoming SAMs, the Yak-28PP was equipped with the SPO-3 *Sirena-3* Radar Homing & Warning (RHAW) receiver system, which was housed with the *Lilac* system, comprising the SPS-141, SPS-142 or SPS-143 systems, in the gun



THIS IMAGE & INSET ***Members of the public get a close view of Yak-28PP "Blue 60" of the 118th OAPREB during an "open house" at Chortkov Air Base in 1990, by which time the*** **Brewer-Es** ***had been painted in a three-tone camouflage. The Yak-28PP was fitted with five receiver antennae located around the extensively glazed large-diameter conical nose.***
AUTHOR'S COLLECTION

bay formerly occupied by a GSh-23Ya cannon on the starboard side of the nose.

It was decided that the Yak-28PP would enter V-VS service with the *Razvedyvatelnaya Aviatsionnaya Eskadrilya* (reconnaissance aviation squadrons) then operating the Yak-27R and Yak-28R tactical-reconnaissance variants, in order to simplify maintenance and repair of the aircraft, and to simplify their combined operations with the tactical-recce variants. This led to a change in the structure of the reconnaissance regiments, which henceforth would have their first and second squadrons equipped with tactical-reconnaissance aircraft, while the third squadron would be for dedicated electronic warfare duties and equipped with the Yak-28PP.

In each military district within the Soviet Union and within military groups abroad, there was a front-line aviation group which had one or two independent tactical-recce regiments that were not part of the regular divisions, and were designated *Otdelny Razvedyvatelny Aviatsionny Polks* (ORAPs — Independent Reconnaissance Aviation Regiments) or OGRAPs (Independent Guards Reconnaissance Aviation Regiments).

The first series-production Yak-28PPs were sent to the 678th Guards Zabaykalskiy Mixed Test Aviation Regiment at Priozersk, near Lake Balkhash in Kazakhstan, to undergo flight testing. The first operational unit to be equipped with the Yak-28PP was the 11th ORAP, part of the 16th Air Army, at Neu-Welzow in East Germany, in 1970. The unit operated one squadron of Yak-28PPs until the Su-24MP *Fencer-F* took its place in June 1986, its Yak-28PPs moving to the 931st OGRAP at Werneuchen, East Germany.

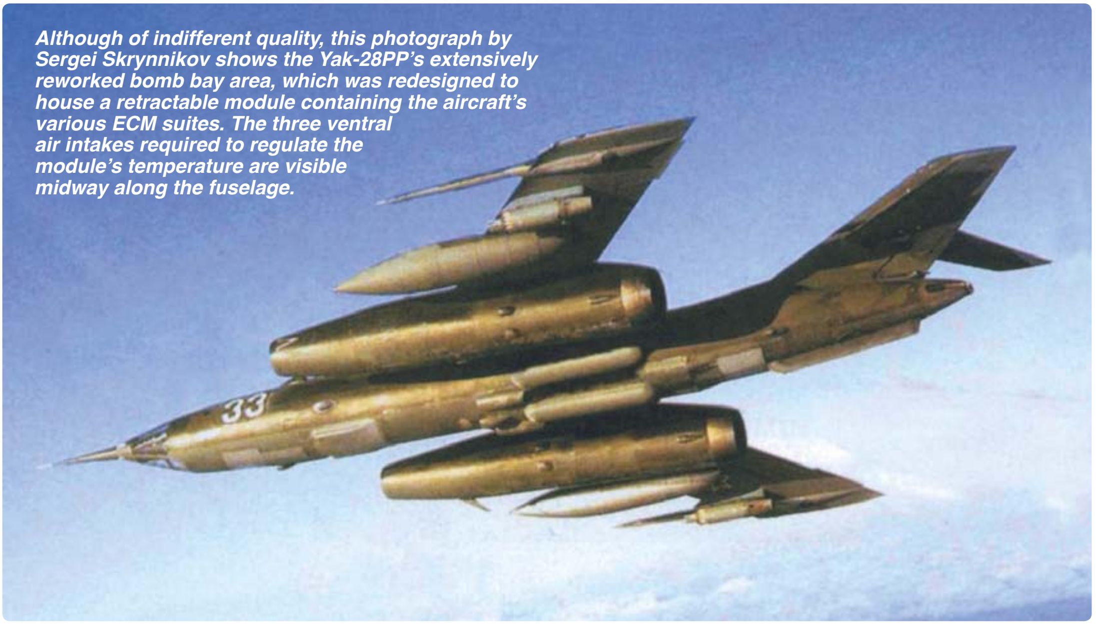
Other front-line Yak-28PP units that operated the type during the 1970s included the following:

- the 193rd OGRAP, 23rd Air Army, based at Ukurey in eastern Siberia;
- the 2nd Squadron of the 668th *Bombardirovchny Aviatsionny Polk* (BAP — Bomber Aviation Regiment), 132nd *Bombardirovchny Aviatsionny Diveeziya* (BAD — Bomber Aviation Division) at Tukums, Latvian Soviet Socialist Republic;
- the 511th ORAP, 5th Air Army, at Buyalyk, Odessa Oblast, Ukraine;
- the 886th ORAP, V-VS Baltic Military District, at Jēkabpils, Latvian SSR;
- the 164th OGRAP, 4th Air Army, at Brzheg, Poland in 1973;
- the 799th ORAP, 1st Air Army, at Ozernaya Pad, Kremovo, north of Vladivostok, in 1975.

In 1981 two V-VS squadrons which would ultimately become dedicated EW units received Yak-28PPs from the units mentioned above. These were the 215th *Otdelnaya Razvedyvatelnaya Aviaeskadrilya* (ORAE — Independent Reconnaissance Aviation Squadron), 4th Air Army, at Brzheg, Poland, and the 229th ORAE, 14th Air Army, based at Chortkov in Ukraine.

A NEW DECADE

In June 1981 the 215th ORAE received a number of Yak-28PPs and Yak-28U two-seat conversion trainers as replacements for its short-legged


Although of indifferent quality, this photograph by Sergei Skrynnikov shows the Yak-28PP's extensively reworked bomb bay area, which was redesigned to house a retractable module containing the aircraft's various ECM suites. The three ventral air intakes required to regulate the module's temperature are visible midway along the fuselage.

MiG-21R *Fishbed-H* reconnaissance fighters and MiG-21UM *Mongol-B* trainers, which had been deployed to Kabul in Afghanistan. This unit was redesignated as the 151st Independent Aviation Regiment for Electronic Warfare (151st OAPREB) in August 1984; it was later reorganised after receiving MiG-25BM *Foxbat-F*s from the former 164th OGRAP, after becoming a part of the 26th Air Army at Schuchin, Belarus, in August 1989. The MiG-25BMs were used to reform the 151st's 1st Aviation Squadron, leaving the 2nd Aviation Squadron to operate the regiment's remaining 26 Yak-28PPs and five Yak-28Us. According to information gathered for the Treaty on Conventional Armed Forces in Europe (CFE), signed in 1990, the unit had 27 MiG-25BM/Us and 20 Yak-28PP/Us in November that year.

The 229th ORAE received Yak-28PPs as replacements for its MiG-21Rs, which had also been deployed to Kabul, during April 1980–June 1981. This led to a change in mission of the unit and its redesignation as the 229th OAPREB. In October 1983 the unit was reorganised as the 118th OAPREB and became a part of the 24th Air Army, as a result of which the unit received Yak-28PP/Us from the 511th ORAP's 3rd Aviation Squadron to form a 2nd Aviation Squadron. In July 1989 the Yak-28PP/Us of the 931st OGRAP (which had previously served with the 11th ORAP) were absorbed by the 118th OAPREB, which thus became the V-VS's most numerous operator of the type, with a total of 37 Yak-28PP/Us in service with its two squadrons by November 1990.

The Yak-28PP was never tested in combat during the Soviet-Afghan War of 1979–89, as the Mujahideen had no SAM systems or early-warning radar capabilities. There were also no Yak-28PP exports, but, thanks to the experience of the Iraqi Air Force and its use of ECM systems against Iranian armed forces during the Iran-Iraq war of 1980–88, the V-VS had the opportunity to improve and develop the EW tactics of its Yak-28PPs and Su-24MPs during 1983–84 as a result. The Yak-28PPs participated in all V-VS exercises, either playing the role of enemy EW aircraft or providing EW escort for the friendly forces.

While the 151st OAPREB provided combat training for all V-VS units based abroad — East Germany, Poland, Czechoslovakia and Hungary — the 118th OAPREB was given similar responsibilities for the training of bomber and fighter regiments inside the Soviet Union. Alexei Vaneyev, a 118th OAPREB test pilot who later served in the Ukrainian Air Force (ZSU), recalls his time in the unit:

"The regiment was formed at Chortkov on October 25, 1983, and its first commander was Lt-Col Perevalov. We were involved in exercises throughout the European part of the Soviet Union. We used passive countermeasures such as chaff and the air-launched decoys for training about once a year at the Sotanov training ground [gunnery range]. After launching the S-5P rockets our view ahead was obscured until we passed through the cloud [of chaff]. Then the aluminium foil [chaff] fluttered around like snow over a Christmas tree.

"The Yaks generated very powerful electronic countermeasures, which sometimes interrupted the work of the Su-24 bombers' radars, jamming their P-18 and P-37 early-warning radars. Also the civilian population within our operational zone faced problems caused by our ECM systems; for example, their TVs began to 'blink' and 'ripple' [when *Bouquet* was switched on] and their radios started 'wheezing' [thanks to the *Fasol-1* system].

ABOVE ***When the Soviet Union collapsed in 1991, the 118th OAPREB was absorbed into the Ukrainian Air Force (ZSU). The last surviving Yak-28PP in Ukraine is "Yellow 59", which is on display at the Ukrainian Air Force Museum at Vinnytsia in west-central Ukraine.***

LEFT ***"Yellow 59" at Vinnytsia retains its UB-16-57M rocket-projectile pods, which would be used to fire S-5P rocket projectiles loaded with chaff ahead of the aircraft as a countermeasure against radar-guided SAMs.***

BELOW ***Following their handover from the V-VS in the early 1990s, the ZSU's Yak-28PPs had the Ukrainian*** **tryzub** ***(trident), representing the nation's coat of arms, applied to their fins, although the camouflage was essentially a hangover from V-VS service.***

SERGEI POPUSEVICH VIA AUTHOR x 3

SERGEI SKRYNNIKOV VIA AUTHOR

ABOVE ***A pair of Yak-28PPs participate in an exercise circa 1991–92. The ZSU inherited 22 of the remaining 39*** **Brewer-Es** ***still in service when the Soviet Union collapsed. The first prototype of the Yak-28PP's intended successor, the Sukhoi Su-24MP*** **Fencer-F,** ***made its first flight in 1980, although ultimately fewer than 15 were built.***

Also, the *Fasol* system could jam the [*Duga*] over-the-horizon [OTH] radar system [used as part of the Soviet anti-ballistic missile early-warning network], at which point Army personnel would contact the pilots and order them to stop jamming.

"In August 1989 the regiment formed a third squadron, with Su-24MPs. The *Fencers* had better equipment designed to suppress modern SAM systems. Nevertheless, the Yak-28PPs were still preferred for use in exercises, and their pilots and navigators never missed a chance to 'pin' the 'enemy' radars."

The Yak-28PP was well-liked by its pilots, who recall it being an exceptionally reliable aircraft. Indeed, the 118th OAPREB suffered no accidents or incidents with the type and only three examples were lost in accidents; a fourth was badly damaged in an incident in the early 1980s. The only notable failures experienced on the type involved the hydraulic system, and fuel leaks from the tanks, but these were swiftly hunted down and cured. Mechanics and technicians enjoyed the easy access to the aircraft's engines, systems and equipment and most maintenance operations could be performed without the use of ladders and other equipment. Alexei Vaneyev describes the type's handling characteristics:

"The Yak-28PP was pleasant to fly, although it had the flight characteristics of a bomber, including a large turning radius and a slow rate of climb. Thanks to its effective ailerons, however, it was easy to barrel-roll. In general, its manœuvrability was limited and it was designed to withstand less than 3g, but there was a time in the 118th OAPREB when a Yak-28PP withstood 10g, maybe more; the needle, calibrated up to 10g, went off the dial.

"The pilot had executed a barrel roll in the clouds in bad weather and lost spatial orientation. In an inverted position he pulled the stick back and descended; near the ground he restored his orientation and pulled out of loop, and the aircraft miraculously gained altitude.

"The navigator hadn't been able to grab the handle of his ejection seat owing to the overload, and they landed together. They tried to hide the incident by destroying the tape recording, but technicians noticed that the aircraft was overstressed some three or four times beyond its g-limit."

Indeed, a look at the engines' air intakes during the post-flight inspection revealed 2–3cm gaps between the engine nacelle and the inner surface of the air intakes.

RETIREMENT AND UKRAINIAN SERVICE

By the early 1980s the West was introducing a fresh generation of sophisticated new SAM systems, including the MIM-104 Patriot with phased-array tracking. The ECM systems of the Yak-28PP had been developed in the 1950s and 1960s and were rapidly becoming ineffective and increasingly obsolete. Even in the early 1970s the V-VS did not envisage the Yak-28PP as the blueprint to meet to its requirements for an EW aircraft for the 1980s, which led to the development of the EW variant of the Su-24 strike bomber.

The Yak-28PP's SPS-5-28 *Fasol* jammer was somewhat technologically backward compared to the equivalent systems installed on American

WWW.AIRFORCE.RU VIA ANTON PAVLOV

ABOVE ***Yak-28PP "Blue 50" was one of a number Yak-28s of various sub-types to be sent to Pushkin, near St Petersburg, for overhaul in the very early 1990s; they were ultimately withdrawn from service while there, however, and remained on the west side of the airfield until 2002, when most were unceremoniously scrapped.***

EW aircraft like the USAF's General Dynamics EF-111A Raven and the Grumman EA-6B Prowler used by the US Navy and Marine Corps. The *Fasol* had to be operated manually and generated insufficient power. This, and other problems with the antenna, meant that by the mid-1970s it was nearly impossible to jam modern radars using the SPS-5 in a battlefield environment. Even after modernisation of the system, it was still problematic, as the increase in power led to interference within the aircraft's own communications systems and could affect other aircraft flying nearby. There were also concerns about the equipment's negative effect on the crews' health. The Soviet Minister for the Radio Industry, V.D. Kalmykov, said: "The only thing it interferes with is the work of our Ministry".

The Yak-28PP was gradually withdrawn from service with its units as follows: the 511th ORAP in 1983; 164th OGRAP in 1984; 11th ORAP in June 1986; 193rd ORAP in 1989; 799th ORAP in 1989 and 931st OGRAP in July 1989.

This left the 118th and 151st OAPREBs as the last V-VS operators of the type between 1990 and 1992, although the 678th Guards Zabaykalskiy Red Banner Mixed Test Aviation Regiment at Priozersk kept several Yak-28PPs airworthy for test purposes until 1994.

Production of the Su-24MP *Fencer-F* EW variant was started concurrently with production of the Su-24MR *Fencer-E* tactical-reconnaissance variant at the Novosibirsk Zavod in 1983. The restricted mission-capability of some of the ECM systems fitted to the ten production Su-24MPs in East Germany, however, forced the V-VS to keep the Yak-28PP in service until the Su-24MP could gain its optimum combat capability. In the event, this never occurred, with the result that 39 Yak-28PPs remained operational with the V-VS until 1991, when the Soviet Union collapsed.

YAKOVLEV YAK-28PP *BREWER-E* DATA

Powerplant 2 x Tumansky R-11AF2-300 turbojets, each of 3,950kg (8,708lb) thrust (dry) and 6,120kg (13,490lb) with afterburner

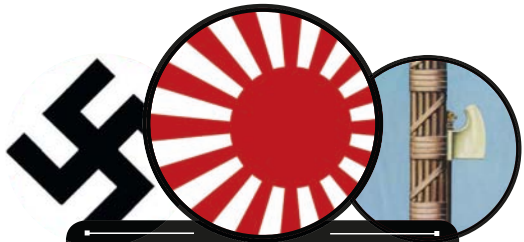
Dimensions		
Span	11·64m	(38ft 2¼in)
Length	22·3m	(73ft 2in)
Wing area	35·2m²	(379ft²)
Weights		
Loaded	15,725kg	(34,667lb)
Performance		
Maximum speed		
at sea level	1,100km/h	(684 m.p.h.)
at 12,000m (39,400ft)	1,880km/h	(1,168 m.p.h.)
Service ceiling	15,650m	(51,350ft)
Normal range	2,450km	(1,520 miles)

The 151st OAPREB, 26th Air Army, continued as part of the post-collapse V-VS, with all 17 of its Yak-28PPs remaining in service until January 1993, when it was disbanded. This left the 118th OAPREB, by this time absorbed into Ukraine's ZSU, as the very last operator of the Yak-28PP, the unit flying its 22 examples until December 1994, when it was moved to Kolomyia in western Ukraine. Here it was quickly disbanded and its erstwhile aircraft scrapped or put into storage at Ovruch in northern Ukraine.

Of the 84 built, five Yak-28PPs survive today. These are "Yellow 59", c/n 0970807, exhibited at the Ukrainian Air Force Museum in Vinnytsia in west-central Ukraine; former Belarusian Air Force example "Red 01" (c/n 9970404) at the Belarus Aerospace Museum at Minsk; former V-VS Yak-28PP "Blue 45" at Irkutsk Northwest Airport in Siberia, plus two — "Blue 43" and "Blue 53" in poor condition at the Central Air Force Museum at Monino, Moscow.


The Automobile
If your passion is for earlier cars – everything from Austin Sevens and Model T Fords to Rolls-Royces and Hispano-Suizas – then *The Automobile* is for you. Our monthly magazine is the only one in the world specialising in pre-1960 motor cars.
We insist in-depth research goes into all the articles we publish. Our specialist authors delve deep into the archives to find information and images that have never before been published. *The Automobile* is elegantly written and illustrated by original photographs, technical drawings and artwork.
CALL **01306 628385**, QUOTING **AH1**, TO CLAIM YOUR **FREE** SAMPLE ISSUE


Fur Lined Leather
Flying Jacket
Sizes Small - 3XL
£99
Order Online at
www.meanandgreen.com
or call 01902 423868
Children's sizes also available for £75



THE AXIS'S WARTIME AIR LINKS

BERLIN OR BUST

JAPAN'S TOKYO–BERLIN ATTEMPT, 1943

In the second article in his three-part series on the air links established by the Axis forces during the Second World War — or lack thereof — **RAY FLUDE** examines Japan's desperation to get a delegation to Berlin to promote the idea of a ceasefire between the Soviet Union and Germany, and its ill-fated attempt to establish a Tokyo—Berlin air bridge

BETWEEN JANUARY and July 1943 the Japanese government tried to arrange a mission to Germany using both its ability to send diplomats overland through the Soviet Union and its project to develop an aircraft which could fly to Europe. The purpose of the mission was to explain Japan's non-intervention policy in the Russo-German conflict and to ask the German leadership about the possibility of its agreeing an armistice with the Soviet Union.[1] The Japanese were also trying to foster a weapons technology exchange programme with Germany (see Ted Oliver's *Hands Across The Water?* in *TAH16*).

Negotiating an armistice on the Eastern Front so that the Germans could focus their efforts on fighting Britain and the USA had been a strand within Japanese policy since the German invasion of Russia in 1941. Japan had received no warning that Operation *Barbarossa* was about to take place, and senior officers in the Imperial Japanese Army watching the Soviet Union closely from Manchuria believed that the invasion started too late in the year to achieve the first important objectives before the weather turned. As a result, victory would become almost impossible to achieve.[2] By 1943 the balance on the Eastern Front was shifting in favour of the Soviet Union.

Up to this point the Japanese had focused on trying to convince the Germans to make overtures to the Soviets to produce a ceasefire, but from now on pressure would have to be placed on the Soviet Union to take the lead. The Japanese leadership thus made a great effort to get a delegation to Europe, and this latest initiative involved an overland journey of more than 8,000 miles (12,900km) and a planned flight of more than 9,500 miles (15,300km). This supreme effort was as close as Germany and Japan came in the whole of the war to arranging the kind of face-to-face exchange of views and discussion of strategy that had been the regular practice for the Allies since at least January 1942.

JAPAN'S TECHNICAL PROBLEMS

Japan had been exerting continuous pressure since early 1942 to get Italian and German flights under way which could carry Japanese delegations to Europe, but it had also been working hard on its own capacity to undertake flights. All three Axis powers had air-service projects under way by the summer of 1942, but the Japanese project had been delayed by technical problems and would not be ready for the first wartime flight to Europe until July 1943. The Japanese had a suitable aircraft to work from — the Tachikawa A26/Ki-77— which had been designed as a record-setting aircraft, intended to fly non-stop from Tokyo to New York in 1940 as a part of the celebration of 2,600 years of the Japanese Imperial Dynasty.[3]

The build-up to the Pacific War had forced manufacturers to concentrate on the development and production of combat aircraft, but in the summer of 1942 the project was given higher priority. By that September the Ki-77-I, the first prototype, had been completed and tests had started, but in the next month design faults had begun to emerge. The engine cowlings overheated, causing fires; this problem delayed the first flight but, at the same time, the Japanese had kept on working with Germany and Italy to use any opportunity to get a delegation to Europe.

Although it was not made explicit at the time, Wolfgang von Gronau, the German Air Attaché

BUNDESARCHIV 183-L09218

ABOVE ***Objective Berlin — by early 1943 Japan's leadership was keen to get a delegation to the German capital to discuss a solution to the ongoing war on the Eastern Front, which the Japanese felt was unwinnable for the Germans. The Japanese Embassy in Tiergartenstrasse is seen here draped in the flags of the Axis partners in 1940.***

ROBERT C. MIKESH VIA GIUSEPPE PICARELLA

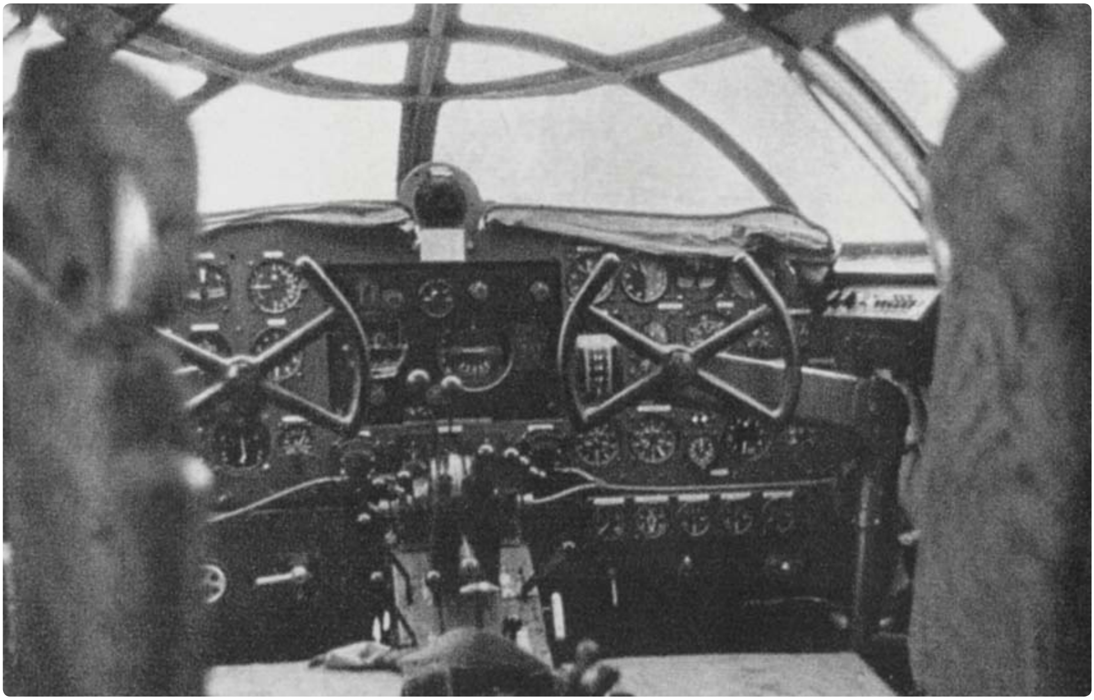
ABOVE ***The prototype Ki-77-I made its first flight on November 18, 1942, and in January 1943 it undertook a successful test flight between Tachikawa, near Tokyo, and Fukuoka on Kyushu.*** **RIGHT** ***Wolfgang von Gronau, left, in Japan during his 1932 round-the-world flight in a Dornier Wal. He would go on to become Germany's air attaché in Tokyo throughout the war.***

in Tokyo, later explained in his autobiography that he was quite clear in his own mind that the Japanese flights were intended to help bring about an armistice between Germany and the Soviet Union on the Eastern Front.[4]

The customary route for diplomats travelling between Germany and Japan, even after the outbreak of the war in Western Europe, was overland using the Trans-Siberian Railway. More than 1,000 Japanese personnel had passed this way between September 1939 and the German attack on the Soviet Union, taking advantage of the fact that Japan and the USSR were not at war. When Germany invaded the Soviet Union in June 1941 the movement of Japanese diplomats to Europe was halted and the route re-opened only in July 1942 after a further agreement had been negotiated. The overland route was still available only to those who could be identified as diplomats, and its continued use was frequently threatened by disputes between Japan and the Soviets over the intricacies of the Neutrality Agreement signed in 1941.

In August 1942 the Japanese minister in Ankara, Turkey, was ordered to obtain Soviet transit visas for a group of personnel to travel from Europe to Japan. These were Lt-Gen Ichiryo Sakanishi, Col Bin Yamamoto, Col Takei Yorigashi, Lt-Col Shozo Nakamura and Maj Takeo Ishizaka, all of whom were travelling from Germany. These were high-priority travellers. Yamamoto was the liaison officer working with Indian nationalist leader Subhas Chandra Bose (who was negotiating with the Axis forces to rid India of British rule), clearing the way for his eventual arrival in the Far East. Nakamura would be a key part of the information exchange in 1943.

Another dispute and delay arose over visas, and, although the visa for Nakamura was requested before August 11, 1942, he did not arrive back in Japan until January 1943.



ROBERT C. MIKESH VIA GIUSEPPE PICARELLA

At a high-level Liaison Conference in Japan at the end of February 1943 it was decided to use the overland route to send a substantial delegation from Japan to Germany. This decision followed on from the return of Nakamura overland from Europe, and the mission was intended to be the next step in Japan's efforts to get a firm voice in Berlin to encourage the Germans to consider peace with the Soviet Union. There was anxiety in Tokyo that Japan's ambassador in Berlin, General Hiroshi Ōshima, who had been in Germany almost continuously since 1934 as Military Attaché and then Ambassador, had become too close to the German leadership, shared their views too closely and had lost his ability to be an independent voice.

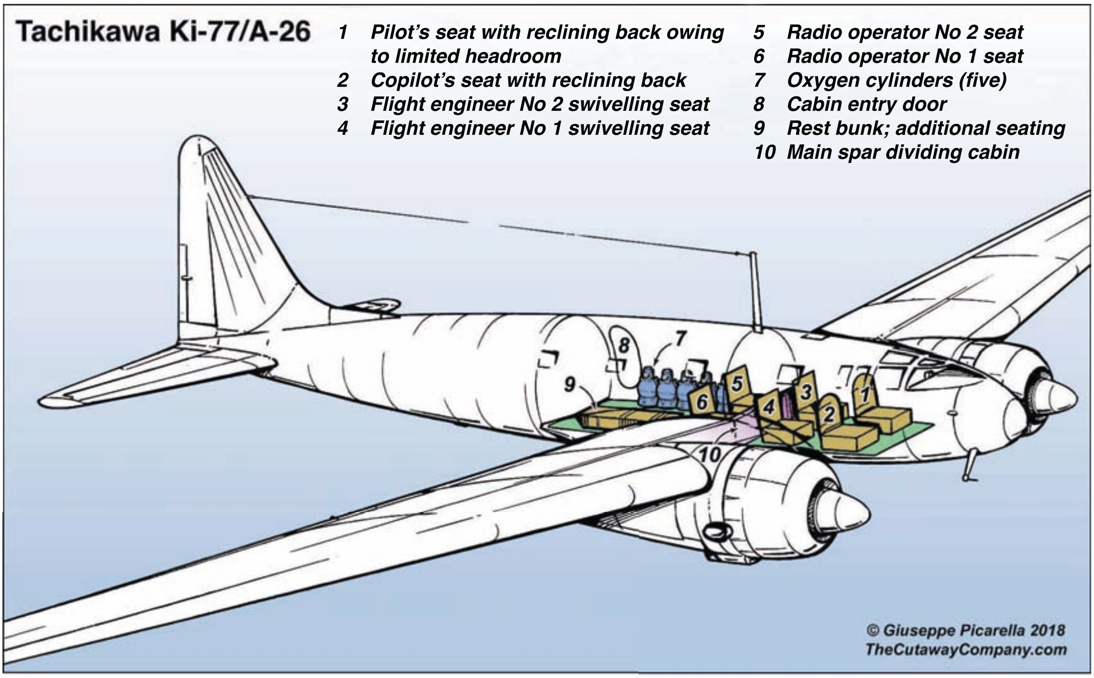
THE OVERLAND ROUTE

The Japanese mission, led by Maj-Gen Kiyotomi Okamoto and Lt-Col Etsuo Kotani,[5] travelled to Europe by train, from Manchouli on the Manchurian border to Krasnovodsk (now Türkmanbaşy in Turkmenistan) on the Caspian Sea; thence across by boat to Baku, through to the Turkish border via Georgia and Armenia and on to Germany. Both the leaders were identified as Military Attachés for the purposes of their travel across the Soviet Union and the party included the new ambassador to Rome. Okamoto was well qualified to lead the mission. He had been a Military Attaché in Berlin, in charge of the Army General Staff Intelligence Bureau in 1941 and had worked with Field Marshal Terauchi in Singapore. He was also a friend of the Imperial family, particularly the Emperor's brother Chichibu. His colleague Kotani was also an important Army Intelligence expert based in Manchuria, and had been in charge of the Soviet sub-section.

ABOVE ***The two-seat cockpit of the Ki-77, which offered an excellent field of vision. The type's very-high-aspect-ratio wings were of laminar-flow section with 6° dihedral, and contained fuel tanks taking up some 70 per cent of their internal volume. The aircraft's flight-handling characteristics were reportedly excellent, but only two were ultimately built.***

This was a major exchange of representatives and an early example of "shuttle diplomacy". As mentioned, Nakamura had travelled back to Japan from Germany, arriving in January 1943 with up-to-date views and information about German attitudes and plans. He was to travel back to Germany on the proposed first Japanese flight in July 1943, briefed on current thinking in Japan and ready to carry on the discussion. Meanwhile Kotani travelled from Japan to Germany overland with the Okamoto party in March 1943, and was scheduled to go back to Japan on the return flight in July 1943, having met with Hitler, other senior Nazis and Ambassador Ōshima. It was hoped that this exchange of current views and understanding would provide the foundation for serious and informed negotiation.

The Okamoto party left Manchuria on March 10, 1943, and arrived at the Turkish border on March 30. The party was in Ankara on April 7, left Istanbul on the 11th for Sofia, then departed for Budapest on the 14th, arriving in Berlin on the 18th.[6] The delegation set about gathering the maximum amount of information for Kotani to take back with him to Tokyo on the planned



return flight. Okamoto went to Italy around May 25 for five days and was back in Germany on the 30th. In Italy he met with Shinrokuro Hidaka, the new ambassador, and Kase, who had been in charge until Hidaka had arrived from Japan.[7] He then toured the Eastern Front during June 8–12, 1943.[8] Kotani went on further fact-finding trips to Madrid, Lisbon and the Eastern Front in June.[9] Okamoto then went on to Lisbon and later to Berne in Switzerland. While the information-gathering went on, Okamoto was also compiling reports which were sent back to Tokyo; of course, all these were read by the Allied codebreakers.[10]

AIR ROUTE DEVELOPMENTS

Meanwhile, development of the Ki-77 had been continuing successfully and, on April 20, 1943, the first prototype flew from Japan to Singapore, a journey of some 3,500 miles (5,600km), in 19hr 13min.[11] In April the second prototype, Ki-77-II, was completed and by May the Japanese were making detailed arrangements with Germany for the flight to Berlin. On May 16 a message to the military attachés in Berlin confirmed that it was intended to make a test flight in June over a route from Tokyo, via Singapore, Crete or the Crimea, to Berlin. The aircraft would be referred to as the "SE" by Japan and "GOA" by Germany.[12]

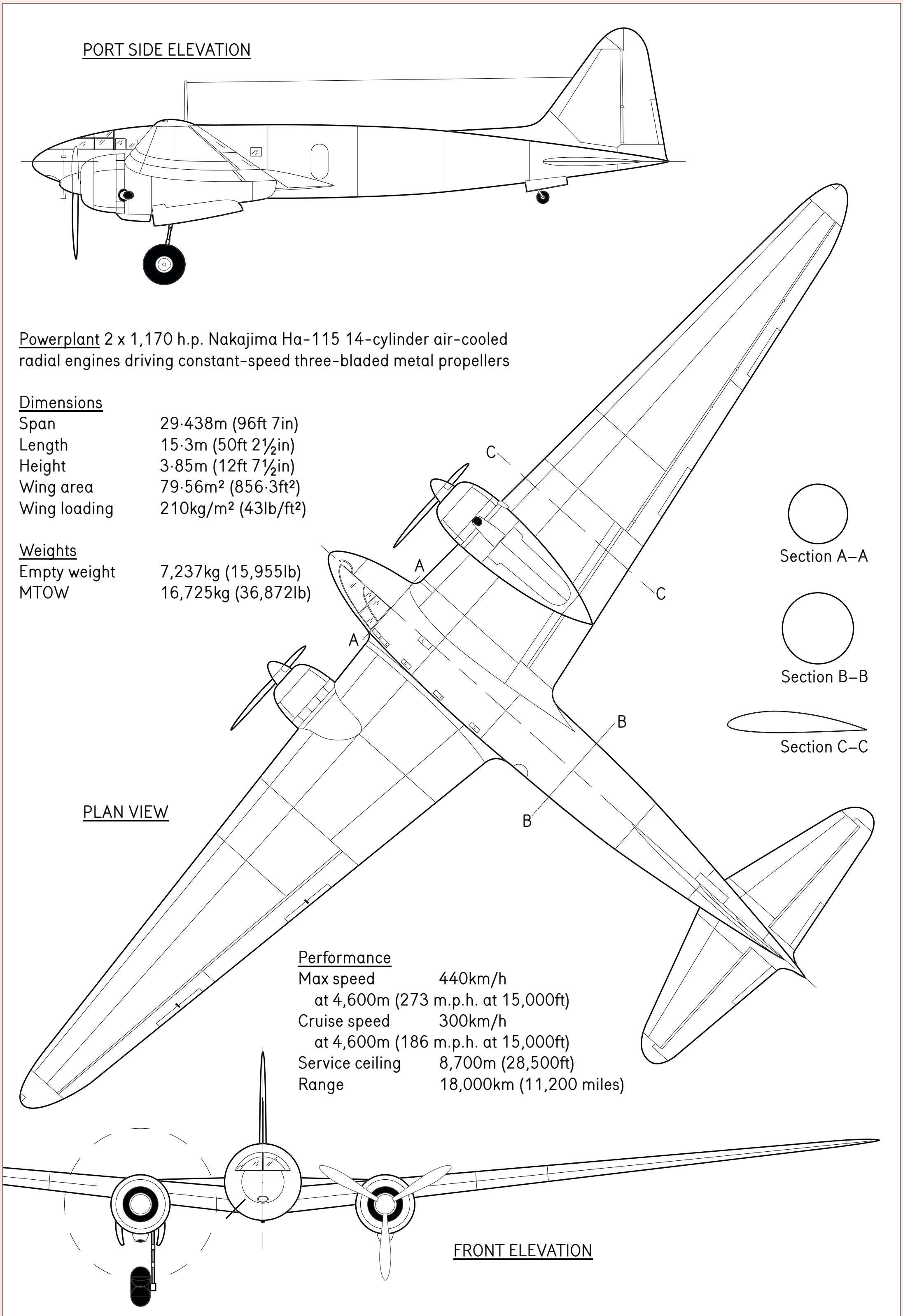
Meetings with the German leadership, the main purpose of the Okamoto delegation's journey to Europe, continued. On May 19 Ambassador Ōshima and Okamoto met with Foreign Minister Joachim von Ribbentrop.[13] The purpose of the overland mission and these high-level meetings was to explain the reasons for Japan's non-involvement in war with the Soviets, and to push for a separate peace between Germany and the USSR. The notes of the meeting with the German Foreign Minister, however, show the complete lack of any shared understanding.

Ribbentrop was still desperately urging Japan to attack the Soviets somewhere — anywhere — because some new initiative was needed to relieve pressure on the Germans on the Eastern Front. Ōshima had to explain that Japan was not only unwilling to attack the Soviet Union anywhere but would prefer to mediate a peace between Germany and the Soviets. Ribbentrop violently denounced Naotake Satō, the Japanese Ambassador in Moscow, as the man responsible for urging peace between Germany and the USSR, but Ōshima had to admit that Satō was

THE KI-77 SPECIFICATION

THE Ki-77'S DESIGNER, Dr Hidemasa Kimura, had drawn on his experience of other ultra-long-range Japanese projects in attempting to meet three key specifications:
- a range exceeding 15,000km (9,300 miles) without refuelling;
- the ability to fly from Tokyo to New York non-stop at a speed of more than 290km/h (180 m.p.h.);
- the ability to fly in the sub-stratosphere to allow research for a future high-altitude transport.

As a result of difficulties with the construction of a pressurised cabin it had become necessary to plan for the aircraft to be able to fly at 8,000m (27,000ft), with the crew breathing oxygen throughout the flight. The aircraft carried a great deal of fuel, and leakages from the integral tanks was always a problem. **RF**



Powerplant 2 x 1,170 h.p. Nakajima Ha-115 14-cylinder air-cooled radial engines driving constant-speed three-bladed metal propellers

Dimensions

Span	29·438m (96ft 7in)
Length	15·3m (50ft 2½in)
Height	3·85m (12ft 7½in)
Wing area	79·56m² (856·3ft²)
Wing loading	210kg/m² (43lb/ft²)

Weights

Empty weight	7,237kg (15,955lb)
MTOW	16,725kg (36,872lb)

Performance

Max speed	440km/h
at 4,600m (273 m.p.h. at 15,000ft)	
Cruise speed	300km/h
at 4,600m (186 m.p.h. at 15,000ft)	
Service ceiling	8,700m (28,500ft)
Range	18,000km (11,200 miles)

Tachikawa Ki-77

Drawn & Traced by
E.L. LEA ORMEROD

ROBERT C. MIKESH VIA GIUSEPPE PICARELLA

ABOVE LEFT ***Hiroshi Ōshima, who served as Japan's military attaché in Berlin from 1934, and as Ambassador to the German capital during 1938–39 and 1941–45. He was later described as being "more Nazi than the Nazis".*** **ABOVE RIGHT** ***Japanese engineers gather around one of the two Ki-77s before another test flight circa 1943.***

only following the agreed Japanese policy line. He had to explain that Japan doubted that Germany could beat the USSR and urged the Germans to negotiate a cessation of hostilities. Ribbentrop angrily rejected all these ideas and proposals.

The German leadership did not recognise or understand the fragility of Japan's situation in the Pacific and the importance of its neutrality with the Soviet Union, while the Japanese failed to recognise the racism and desire to expand to the East which lay at the heart of Nazi ideology, and which was the real key to German strategy.

On May 28 the intermediate stop for the flight was identified for the first time as Sarabus in the Crimean Peninsula, a railway junction 12½ miles (20km) north of Simferopol. The suggested route after flying across India from Singapore and into Afghanistan would be across the southern end of the Caspian Sea, skirting the Russia/Persia (Iran) and Russia/Turkey frontiers, passing over the Black Sea coast at Batum. To avoid infringing Soviet air space this would mean flying across Persia and Turkey. The leg of the flight from Singapore to the Crimea was more than 5,200 miles (8,400km). The pilots were warned that the route would pass near mountains up to 5,000ft (1,500m) in height and that there were also mountains in the south of the Crimean Peninsula.

The aircraft could opt for a landing at either Sarabus or Kertch, depending on the weather. A description of the aerodrome at Sarabus followed, which described the fan-shaped arrangement of runways and taxyways that a pilot would see, and warned about the location of three 50ft (15m)-high hangars. Tempelhof airfield was identified as the final destination in Berlin and the last leg of the flight would cover 1,100 miles (1,800km).[14]

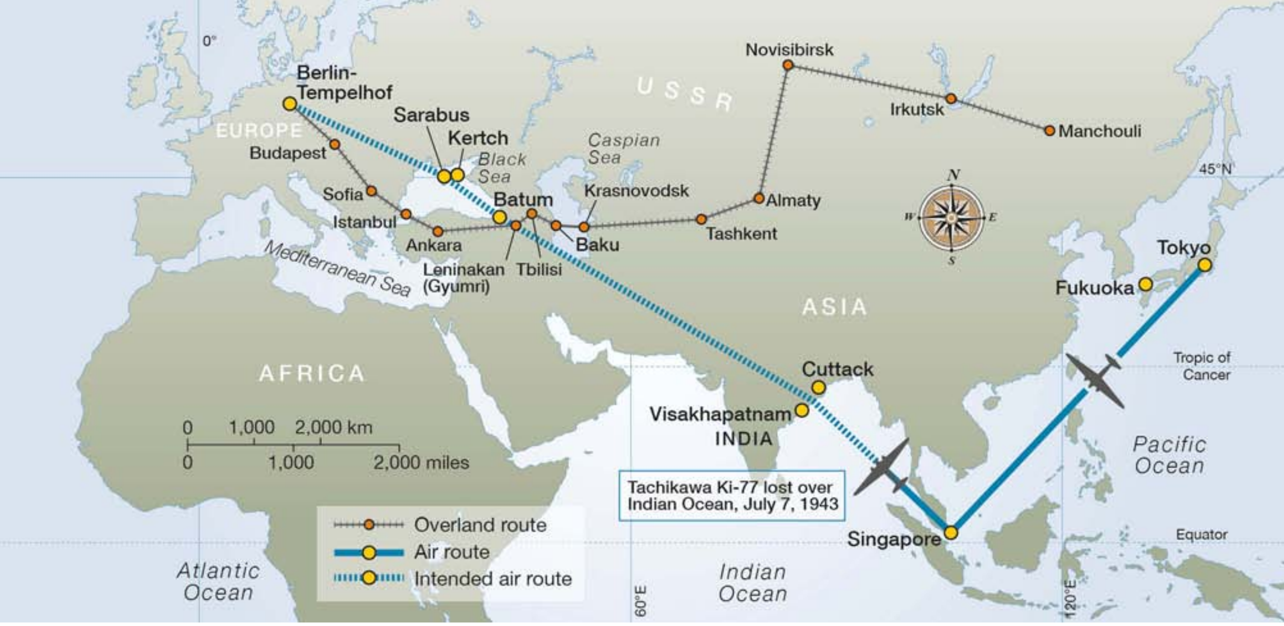
On May 30 the Ki-77-I performed a test overload take-off at the request of the Imperial Japanese Army, which was leading the project.[15] Kimura records that *Seiko* (Success) was the Army's codename for the flight to Berlin, and on May 31, 1943, a Japanese message from Berlin to Tokyo confirmed arrangements for weather reports for the flight.[16] This message was reported to the Allied leadership in the *Magic* Intelligence Summary for June 13, 1943.[17]

FINAL PREPARATIONS

On June 1 the Japanese sent a description of the aircraft that would be making the flight: "Low-wing twin-engined monoplane aircraft, single rudder, fuselage unpainted, wings painted grey with a yellow mark along the inner half of the front edges of the wings. *Hinomaru* [rising sun insignia] on both sides of the fuselage and the underside of both wings". The span was quoted as 30m (98ft 5in) and its height 3m (9ft 10in). "If there are other items which are used in Germany for the identification of friendly aircraft which our aircraft should adopt please inform us at once."[18]

Preparations for the flight of the SE/GOA aircraft had reached an advanced stage by June 24, 1943, when the Commander-in-Chief of the Luftwaffe sent a message to alert Luftflotte 4 on the Eastern Front about the coming flight and the preparations it needed to make, as follows:

- "Take-off [from] Tokyo not before June 28. Take-off [from] Singapore for the flight to Sarabus one day after departure [from] Tokyo, 2359hr GMT. Approximate time of flight Singapore to Sarabus 34hr, consequently time of arrival will be about 1000hr. Take-off from Tokyo and Singapore will be notified in good time to Luftflotte 4;
- "The [aircraft] has been absolutely forbidden to fly over ships and convoys in the Black Sea area.



MAP BY MAGGIE NELSON

Two single red stars fired successively have been arranged as recognition signals. The [aircraft] has a retractable undercarriage;

■ "For reception in Sarabus, Japanese *Generalmajor* Otani will arrive from Berlin with a Japanese *Major* as aide. It is requested that billets be assigned in Sarabus for both these gentlemen, as well as for the crew of GOA, which consists of an *Oberst*, two *Oberstleutnants*, two *Flugkapitäns* of *Hauptmann* rank, two *Ingenieurs* of Hauptmann rank and one W/T operator."[19]

The Japanese shared information with their embassy in Rome on June 27, 1943, confirming that the SE/GOA flight was due to take off on June 30, and that the route would run from Tokyo to Singapore, the Crimea and Berlin with a crew of six plus Lt-Col Nakamura. "It is planned to make a trial flight to Italy at a later time, and we are beginning talks for working out the connections. This is strictly secret".[20] This information is in the *Magic* Intelligence Summary for July 1.

The British intelligence analysts at Bletchley Park picked up the reference to Nakamura, who would be the principal passenger on the SE/GOA aircraft according to the June 27 message. His card in the personnel card index, kept by those watching the military attaché signals traffic, records that he had returned to Japan from Germany in December 1942 overland across the Soviet Union and arrived in Tokyo in January 1943, and notes that he was the "passenger in the SE aircraft".[21] According to American intelligence, Nakamura had been at Imperial HQ in Tokyo in November 1941, then in Italy and Germany as a representative of Japan's War Ministry.

On June 28 the Berlin Attaché office confirmed to Tokyo that Lt-Col Kotani would be the passenger on the return flight, thus completing the communications loop.[22] Kotani had only arrived in Berlin on April 18 that year after travelling overland with Okamoto's party. It was clearly part of the plan for this delegation that a key member would return as soon as possible to Japan with feedback from the wide-ranging discussions and information-gathering visits that had taken place. This was intended to be the foundation for further missions, exchanges of views and for negotiations.

ROBERT C. MIKESH VIA GIUSEPPE PICARELLA

ABOVE ***initial design work on the Ki-77 specified a "sealed oxygen cabin", unpressurised but sealed to prevent loss of oxygen, so as to minimise the use of oxygen masks for the crew on flights of extremely long duration; in the event, the crew did have to use masks fed from cylinders loaded aboard, as seen here.***

On June 30, 1943, the Ki-77-II took off on the first leg of the flight to Berlin, and the first stage

to Singapore was successfully completed. In Berlin Ōshima tried to arrange an urgent meeting for Okamato and Kotani with Hitler on July 6. He explained that Kotani was shortly going to return to Japan.[23] There is a note dated July 8 in the military attaché files which indicates that July 15 was the planned date of the Ki-77's departure for the return flight to Tokyo.[24]

SUCCESS?

This incredibly ambitious plan to complete a significant and rapid exchange of representatives was unsuccessful, however. On July 7, 1943, after leaving Singapore en route to Berlin, the Ki-77 was lost over the Indian Ocean. Kimura's account simply states that the aircraft left Singapore and was never heard from again. Other sources say that a last radio message was received on July 7 from over the Indian Ocean. According to Kimura the names of the crew of the aircraft were Nagatomo, Kawasaki, Tsukagoshi, Nagata and Kawashima, together with three Army officers.[25] Wolfgang von Gronau suggests these were high-ranking officers, but no evidence has been found other than that referring to Nakamura.[26] In discussion with von Ribbentrop, Ōshima had suggested that no important people would be on the first flight owing to the danger. If the flight was a success, senior military and political figures were to be passengers on later flights.

Following a "great circle" route from Singapore, the aircraft would have been intending to cross the eastern coast of India between Visakhapatnam and Cuttack. By leaving Singapore at midnight GMT — around 0800hr local time — the aircraft should have reached the Indian coast at dusk and would then have crossed the sub-continent at night. By the first week of July the entire country usually experiences heavy monsoon rain, and on July 7/8 at Dum Dum airport, Calcutta, where flying had been impossible for two days, an RAF photo-recce Spitfire took off to assess conditions. It climbed to 30,000ft (9,000m) through very violent storms but still could not get above the cloud cover and had to abandon the flight.[27]

Wolfgang von Gronau recorded in his memoirs that it was generally believed that the Japanese aircraft had been lost in a storm. Another source suggests the aircraft was intercepted and shot down using information from *Magic/Ultra* intercepts. All the background details decoded and circulated to the Allied commands means that information was available to the British and American forces at a time which would have allowed a deliberate interception of the Japanese aircraft, but there is no direct documentary evidence that this was planned or undertaken by the Allies. It seems more likely that the weather was indeed the cause.

THE AFTERMATH

THERE WAS NO further attempt to fly to Berlin from Tokyo and the arrival of Spitfires in numbers in India in November 1943 would have made any repeat of the flight over this route even more dangerous. Three squadrons of Spitfire Mk Vcs were in place in November 1943 and three more squadrons of the Mk VIII, able to fly at more than 400 m.p.h. (644km/h) at 40,000ft (12,000m), arrived by January 1944.

Kotani did not make the journey back to Japan during the war but remained in Berlin until he travelled to Switzerland in March 1945. He was a highly experienced intelligence officer, and it was accepted that his diplomatic roles were a façade. He was appointed part-time attaché for Bulgaria in April 1943 as a cover, and after the failure of the Japanese exchange flights in July 1943 he went on to co-ordinate Japanese intelligence activity in Europe against the Soviet Union.

Okamoto continued to play a key role as a leader of the Japanese "liaison men" in Europe. His messages to Tokyo were considered highly important by the Allied analysts working on the *Magic/Ultra* material because of his access to high-level discussions. He attended meetings with Hitler, Ōshima and German generals Keitel and Jodl. In October 1943 he visited France and the Low Countries, describing the German defences in detail in his reports to Tokyo. He was later sent to Berne in November 1943 and became military attaché there in January 1944. From this position he co-ordinated other Japanese intelligence activity in Europe and in 1945 he played a part in some of the attempted negotiations to bring the war to an end. He committed suicide in Switzerland shortly before the end of hostilities. **RF**

The Japanese reacted immediately to the loss and on July 9 a message was sent as a circular to all embassies: "The Japanese Army aircraft bound for Europe has been missing since it left Singapore. Listen to all British broadcasts and if you hear anything about this aircraft let us know immediately".[28] This message was in the *Magic* Intelligence Summary circulated to the Joint Chiefs of Staff by July 15, 1943.

"I AM AT MY WITS' END . . ."

Ambassador Ōshima was distraught about the failure of this flight and pleaded for another attempt to be made. He was particularly concerned about the failure to deliver Kotani back to Japan and wrote to Tokyo on July 9:

"The military situation in Europe is now undergoing vast changes, and if you say that we don't have to worry immediately about air liaison with Germany you are wrong. If we cannot do so precious time will be lost and my people cannot keep up their work. I am at my wits'

end already. This is no time to give up the idea."[29]

The Ki-77 was certainly capable of making the flight to Europe, and this was demonstrated clearly on July 2, 1944, when the Ki-77-I took off from Sinking airfield on a test flight and flew around a triangular course in Manchuria. After 57hr 11min, with the crew exhausted, the aircraft landed, having covered 10,212 miles (16,435km) non-stop, proving beyond doubt the effectiveness of the design. The fuel the aircraft still had on board could have taken it an additional 1,120 miles (1,800km). The distance of the flight from Singapore to Sarabus was only 5,200 miles (8,400km) and was expected to take a comparatively short time of 34hr.

At the end of the war the first prototype was taken to the USA and scrapped without any further testing. Its significance was not realised until years later.[30]

The Italians and the Japanese were out of the air-link picture after the summer of 1943. Italy, after a first successful flight to Japan (see *TAH24*), had not been able to repeat the achievement and by mid-September had surrendered to the Allies. The Japanese flight had failed and would not be repeated. It remained to be seen if a sufficiently overwhelming need could stimulate the Germans to find a way through the chaos of their hierarchy, gain the use of the aircraft they had available and make their own flights.

NEXT TIME *The author concludes the series with an in-depth look at Germany's efforts to establish an air link with Japan — and the reasons why it failed*

1 *Koutani Etsuo Taisa Kaisoroku* (Memoir of Col Etsuo Koutani), Vol 3 (Feb 1942–Feb 1943), The Military Archives of the National Institute for Defense Studies. The author is grateful to Dr Ken Kotani, Senior Fellow, Center for Military History, National Institute for Defense Studies, for verifying the purpose of the mission in Koutani's memoir, See also Note **5**
2 Tsuji, Masonobu, *Singapore: The Japanese View* (London, 1962) p15. Published in Japan in 1951
3 Kimura, Dr Hidemasa. All these references are to the account by designer Kimura of the development and use of the Tachikawa A26/Ki-77 in *RAF Flying Review International,* Vol 19, No 6, February 1964, p43. The aircraft was known as the Tachikawa A26 in the early stages of development because it was sponsored by the newspaper *Asahi Shimbun*. Kimura continues with this in his interview although most other sources refer to it as the Ki-77-I.
4 von Gronau, Wolfgang, *Weltflieger Erinnerungen 1926–47* (Stuttgart, 1955) p239
5 Although Etsuo Kotani's family name is spelt in this way consistently by the British and American codebreakers and intelligence experts, it is more correctly spelt Koutani. Thanks to Dr Ken Kotani for pointing this out. See also his book *Japanese Intelligence in World War II*. We have used the spelling used by Allied codebreakers for the sake of consistency
6 Information summarised from references in Bletchley Park Card Index JMA 108 to Japanese Military Attaché messages *JMA/zip 136 Tokyo to Berlin, JMA/zip 2015 Berlin to Tokyo* and *JMA/zip1805 Berlin to Tokyo*. On loan from GCHQ
7 *The MAGIC Documents Summaries and transcripts of the top-secret diplomatic communications of Japan 1938-45*, University Publishers of America, also index and calendar. SRS 7/6/43
8 MAGIC Documents op cit, SRS 11/6/43 and Boyd, Carl, *Hitler's Japanese Confidant* (Kansas, 1993)
9 Bletchley Park JMA 108 Japanese Military Attaché Messages Personnel Card Index — cards for Kotani
10 MAGIC Documents op cit SRS 990 June 8, SRS 993 June 11
11 Kimura, 1964 op cit
12 US National Archives, Washington, Record Group 457, Japanese diplomatic messages intercepted and decoded. SRA 00235, military attaché telegram, Tokyo to Berlin, May 16, 1943
13 UK National Archives (TNA), captured German Documents TNA ref GFM F13/119, notes of a meeting between von Ribbentrop, Ōshima and Okamoto, May 19, 1943
14 Information summarised from references in Bletchley Park Card Index JMA 108 to Japanese Military Attaché messages *JMA zip 2135, 2071*
15 Kimura, 1964 op cit
16 US National Archives, Washington RG 457 SRDJ 37957, diplomatic telegram, Berlin to Tokyo, No 171, May 31, 1943
17 MAGIC Documents op cit, SRS June 13, 1943
18 MAGIC Documents ibid
19 TNA, Government Code and Cypher School: Signals Intelligence passed to the Prime Minister. TNA ref HW 1/1770, Luftwaffe message from C-in-C to Luftflotte 4, June 24, 1943 (translation by Bletchley Park)
20 MAGIC Documents op cit, SRS July 1, 1943
21 Bletchley Park JMA 108 Japanese Military Attaché Messages Personnel Card Index — cards for Shozo Nakamura. On loan from GCHQ
22 Bletchley Park JMA 108 Japanese Military Attaché Messages Personnel Card Index — cards for Kotani
23 TNA ref HW 1/1816, diplomatic telegram Berlin, Ōshima to Tokyo, July 6, 1943, passed to Churchill July 10, 1943
24 US National Archives, Washington, Berlin Attaché Office, NARA Microcopy T78 Roll 357 Frame 6317704, notes July 8, 1943
25 Kimura, 1964 op cit
26 von Gronau, Wolfgang, op cit, p239
27 TNA, various RAF Squadron Records for July 7–9, 1943, held in TNA ref AIR 27
28 US National Archives, RG 457 SRA 01169, diplomatic telegrams Military Attachés, Berlin to Madrid, No 351, July 9, 1943
29 US National Archives, RG 457 SRDJ 40323/4, diplomatic telegram, Berlin, Ōshima to Tokyo, No 750, July 9, 1943
30 Mikesh, Robert, *Broken Wings of the Samurai* (Shrewsbury, 1993) p143

MAKING A PIG'S EAR FROM A SILK PURSE . . ?

'Anglicising' the McDonnell Douglas F-4 Phantom

In the latest in his ongoing series of articles looking at various aspects of Britain's post-war aviation industry, **PROFESSOR KEITH HAYWARD FRAeS** turns his attention to the troubled procurement of the F-4 Phantom for the Fleet Air Arm and RAF, described at the time by Denis Healey as "a clear example of why *not* to adapt foreign purchases . . ."

THE McDONNELL Douglas F-4 Phantom II has arguably never been one of the world's more æsthetically pleasing aircraft; but it was unquestionably the finest combat aircraft of its generation. As an emergency "gap-filler" for the RAF at a time when it was missing a "supersonic Hunter" (which had been cancelled in the mid-1950s), and for the Fleet Air Arm (FAA) when it was looking for a generational leap into supersonic carrier aircraft, the F-4 was an inspired choice. However, the British government was determined to maximise domestic industrial returns from what would have been an expensive dollar purchase by "Anglicising" the Phantom with a Rolls-Royce supersonic Spey engine and a Ferranti nav/attack system, along with other British equipment including Martin-Baker ejection-seats.

It was a course of action that led to a massive cost escalation; ultimately the programme cost a staggering £500m. More than £110m of that eye-watering price-tag was for additional research and development (R&D) for the type, compared to the first "realistic" estimate of around £34m.

Moreover, with their "flyaway" price having doubled, the UK's F-4s initially seemed to be less capable than an equivalent "off-the-shelf" procurement. According to Denis Healey, the Secretary of State for Defence during 1964–70, the Phantom was a "clear example of why not to adapt foreign purchases".[1] As the archives reveal, procurement of the Phantom certainly caused problems for the Ministry of Defence (MoD), yet RAF and FAA pilots considered it to be a superior product. It also came to fill a critical gap in UK operational and industrial development at a time of considerable policy confusion.

An "Anglicised" Phantom

By the early 1960s both the RAF and Fleet Air Arm, as well as the UK aircraft industry, were hoping to recover from the effects of the "Sandys cuts" of 1957.[2] There was a renewed requirement for conventional military aircraft, with the BAC TSR.2 under development as a long-range bomber and the supersonic V/STOL Hawker Siddeley P.1154 destined initially for both RAF and naval deployment. By 1965 international collaboration, primarily with France, promised a package of combat aircraft and missiles including the Sepecat Jaguar strike/trainer and the advanced Anglo-French Variable Geometry (AFVG) aircraft.

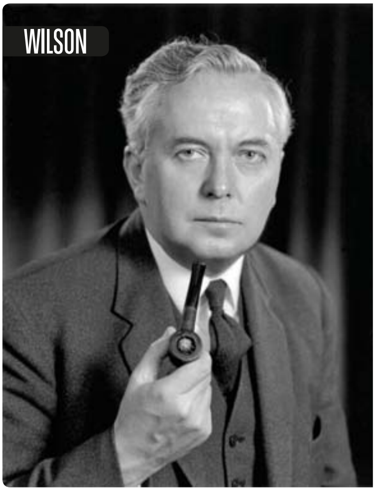
The overall state of the British economy, however, and the affordability of defence equipment, was an increasing preoccupation for the government, and the dollar-costs of overseas procurement would be an ever-present theme throughout the 1960s. The "Anglicisation" of a fine American design seemed a good option to satisfy the FAA's immediate needs, and appeared to be a comparatively cheap option. These needs were initially intended to be met by a joint procurement with the RAF of the P.1154 — an option that was stymied by rivalry between the junior and senior services. Early in 1964 the Royal Navy withdrew from the P.1154 project and moved to procure a new fleet of air-defence interceptors, ultimately selecting the McDonnell F-4 Phantom II (McDonnell merged with Douglas to become McDonnell Douglas in April 1967). Britain would be the first F-4 export customer. As a result, in June 1964 the Conservative government agreed in principle to buy the F-4 (designated F-4K for the FAA examples) with a large proportion of integrated British equipment. A "premium" of about 20 per cent was considered to be a reasonable price to pay for modifications, which would support some key British aerospace capabilities.[3] This premium was essentially the extra cost over and above the "off-the-shelf" price of the aircraft, to be justified by the industrial benefits of incorporating UK technology.

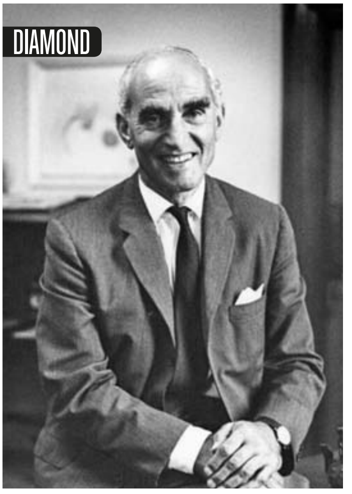
Early cost estimates for the "Anglicisation" programme included £15m primarily for engine development and another £22m for modifications to the airframe (so-called "US" costs). At this point it was felt that there would be some savings from co-development with the RAF P.1154, but the selection of a Bristol Siddeley engine for the latter precluded any degree of commonality. By September 1964 the estimated cost of engine development had risen to £16m.[4] This still seemed to be manageable, however, and acceptable given the importance of the order to UK industry. By the following summer, the situation had been transformed by more accurate data showing that estimates had more than doubled, calling into question the programme's viability. However, this was a problem to be faced by a new government.

Cancellations and industrial policy

In October 1964 the Labour Party won the General Election, and began a review of aircraft and defence programmes that continued until 1966. The new ministerial team was determined to cut the costs of defence, and to curtail what it regarded as an aviation industry out of control. The Plowden Report of 1965 committed the industry to a collaborative future, and both the P.1154 and TSR.2 were cancelled, the latter in

OPPOSITE PAGE, MAIN PICTURE ***With both Spey afterburners roaring and the double-length nosewheel oleo fitted to the FAA's examples fully extended for a catapult launch, Phantom FG.1 XV591 of No 892 Sqn prepares to depart*** **HMS Ark Royal. OPPOSITE PAGE, TOP** ***Denis Healey, Secretary of State for Defence, 1964–70.*** TAH ARCHIVE





favour of another American procurement, the General Dynamics F-111, which was to be bought "off the shelf" (see Chris Gibson's *Swing-wing London?* in *TAH17*).

Having cancelled the P.1154, the Labour government confirmed the Phantom as an interim aircraft for the RAF as well as the FAA. This would involve a "heavy cost", but still be cheaper than carrying on with the P.1154. The Phantom thus escaped the latest round of cuts, and the deal was seen as "a straightforward arrangement with the USA".[5]

By the spring of 1965, however, more detailed cost estimates would reveal another worrying lurch upwards. This was in part attributed to the previous administration having been pressured into developing a Spey-powered Phantom, "a decision made in some haste and on the basis of very sketchy estimates of Spey costs", which had been provided from Rolls-Royce "by telephone". This sudden rise in costs led Prime Minister Harold Wilson to request an internal inquiry to be conducted by the Chief Secretary to the Treasury, John Diamond. In his view, ministers seemed to have been blindsided by officials with updated and more detailed company estimates not available until March 1965. Had these costs been known before January that year, the project may well have been cancelled.[6]

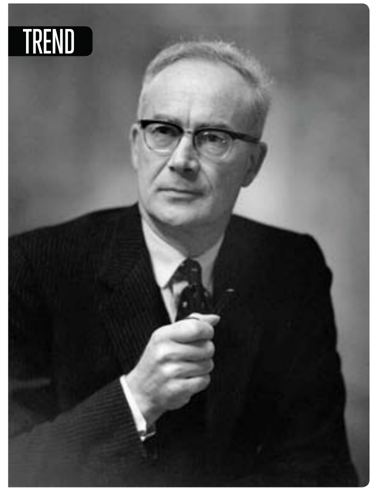
The Ministry of Aviation (MoA), under Roy Jenkins during 1964–65, had been even more sanguine than the MoD, which had at least begun to look at alternatives. Ultimately, the industrial implications of cancellation and the threat to the viability of the carrier force carried the day. There were also cancellation charges to be considered, and, with long lead-time items on order, the programme had simply gone too far to be easily halted. According to Diamond, this had exposed the limits of ministerial consultation with officials with very different perspectives. He felt that there was a need for more carefully judged decision-making, not forced by deadlines. In general "a general willingness to accept cost overruns as normal must be resisted".[7]

Despite growing ministerial concern about rising costs, the overarching long-term industrial implications carried a lot of weight. In March 1965 the government, increasingly aware of negative newspaper reports about rising costs, stressed the importance of developing a new generation of military aircraft equipment. For example, when American company Westinghouse offered a cheaper licence-built agreement with the British General Electric Company (GEC) to supply the attack radar, Minister of Aviation Jenkins argued that this was "an attempt to dissuade us from domestic alternatives [such as] Ferranti" and that further competition would be "inconvenient and wasteful". A similar effort by Elliott Flight Automation to offer a tie-in with the American firm Litton Industries was similarly rejected by Healey on the grounds that, "industrially, [this] is [the] type of equipment which we ought to develop in this country, both for current and future combat aircraft and for its export potential".

While he had some sympathy with Elliott, which, like Ferranti, was suffering from the aftermath of the TSR.2 cancellation, Healey also felt that "this is an important field of aircraft technology in which we will gain great advantage from fostering a British design".[8]

Spiralling costs

British industrial input was now the government's dominant concern and was reflected in the definitive agreement signed with McDonnell and the American government in February 1965. This specified the Spey engine, Ferranti-designed nav/attack radar and Martin-Baker ejection-seats, with Hawker Siddeley appointed as a "sister design firm" responsible for repair, maintenance, design and modification work on the British Phantoms. The Americans would not be liable for any problems with "Anglicisation" — "any penalties involved in terms of cost, timescale and



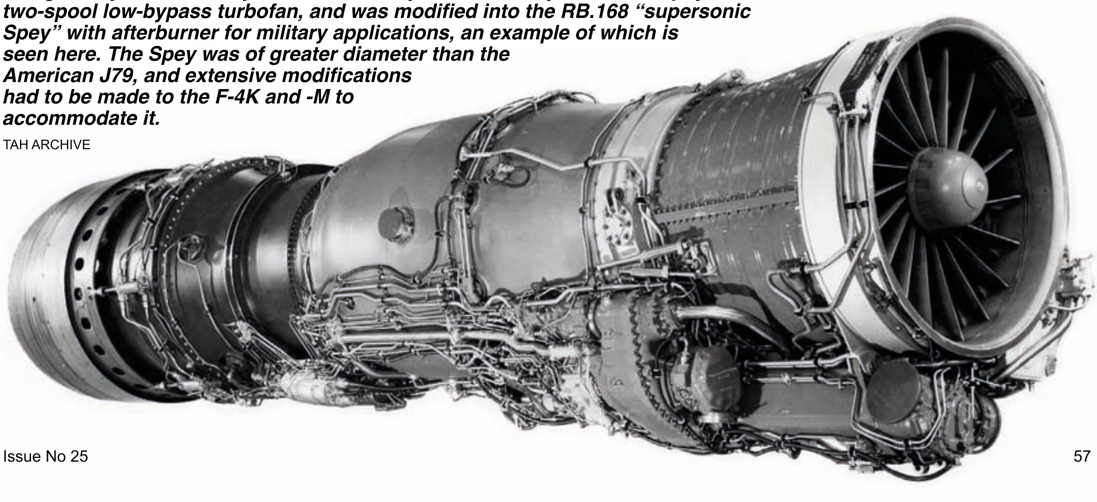
design consideration" would be borne by the UK.

The aim was to obtain about 50 per cent of the contract's value with British firms. The MoD still assumed that this would entail a "UK premium of 20 per cent to ensure [a] competitive position for UK companies", equivalent to £9m, but the MoD would accept up to £42m in extra costs — a considerably higher premium — although this was to be kept from the Americans to obviate any excuse on their part for poor performance.[9] For his part, the Minister of Technology, Frank Cousins, was "satisfied that if we are to avoid serious damage to the industry we must take special steps to safeguard its position".[10]

In June 1965, however, further revised estimates put Phantom development costs at £35m, with the engine up from £12·5m to nearly £25m. Airframe costs had doubled to £40m. Allowing for other contingencies, total development costs were likely to be in the region of £110m. Estimated production costs were also up from £252m to £311m for 286 aircraft.[11] The Paymaster General, George Wigg, told Wilson that he had "long thought that all was not well" with the costs of the Phantom; "I now find my worst fears were more than justified". He wryly continued: "We are going to Chequers [the Prime Minister's residence in Berkshire] trying to save £200m from defence. It makes me wonder whether our journey is really necessary".[12]

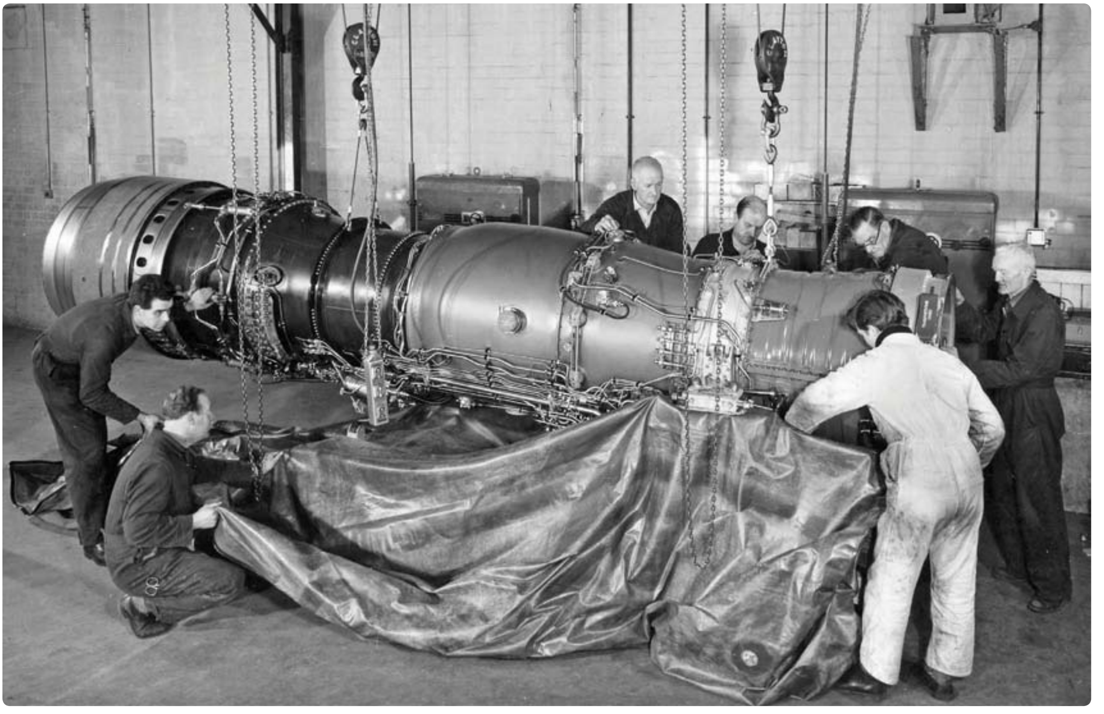
Wilson's officials felt that while Wigg might be going "a bit over the top", "red lights have been glowing everywhere". There was a strong likelihood that the government was looking at "all-up costs" of nearly £424m, with the Spey alone costing £130m, up £45m on the June 1964 estimates. The project's future would now depend on the forthcoming Defence Review. If this meant an end to the carrier force, there might be no need for Spey Phantoms. Indeed, even if the carriers survived, the Spey-powered version may still be vulnerable. At the MoD, Healey was prepared to defer a final decision until the end of September 1965, pending the results of an impact assessment of cancellation on the British aero-engine sector.[13]

In September 1965, conscious of looming contract deadlines, the government reviewed the F-4 programme. This included considering a version powered by a pair of the American Phantom's General Electric J79s, as the advantages of the Spey "may be significantly less than have been hitherto accepted".[14] However, it was felt that the Spey was the only engine offering



Designed by a team led by Frederick Morley, the Rolls-Royce RB.163 Spey was a neat two-spool low-bypass turbofan, and was modified into the RB.168 "supersonic Spey" with afterburner for military applications, an example of which is seen here. The Spey was of greater diameter than the American J79, and extensive modifications had to be made to the F-4K and -M to accommodate it.

TAH ARCHIVE



TAH ARCHIVE

ABOVE ***The first supersonic Spey is prepared for air freighting at Rolls-Royce's Derby factory in November 1965, for shipping to the USA to become one of the pair fitted to XT595, the first of the Royal Navy's two YF-4K prototypes; XT595 made its first flight at St Louis on June 17, 1966, followed by the second YF-4K, XT596, on August 30.***

catapult performance for launch off *HMS Eagle*. There was a promise of an uprated J79, which was already a well-proven design. The MoD was "sensitive" to the industrial issues involved, but it was more concerned about delivering the military requirement. Nevertheless, its supporters contended that the Spey would have greater potential for future development. Reverting to an American engine would also increase dollar costs by £50m for an advanced version of the J79 to match the Spey's projected performance.[15]

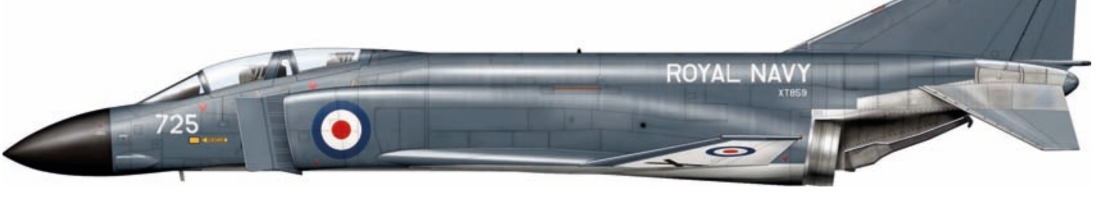
Moreover, the MoA felt that a negative outcome would be "disastrous".[16] Roy Jenkins made a strong case for the British engine:

"The Spey is the next logical step in the development of high-performance jet engines. It involves advances in design, materials and production techniques and in engineering generally, both at [Rolls-Royce (R-R)] and in other parts of the engineering industry. The effects of cancellation on R-R and the aircraft/engineering industries as a whole should therefore not be underestimated; R-R occupies a leading position in the world aero-engine market. This development would help to maintain that position, and its loss would be a severe blow to Rolls's prestige, would present [it] with a formidable task in restoring overseas confidence and would put [it] technically at a considerable disadvantage compared with the USA."[17]

Going with the Spey option

A Cabinet committee meeting on November 14, 1965, strongly supported the Spey Phantom despite the uncertainties of the impending Defence Review. Cancellation would seriously damage Rolls-Royce's competitiveness vis-à-vis the USA. The company was a high export earner — £200m over the previous five years — and developments of the Spey also had good export prospects (indeed, it was a contender for a contract to power the French Dassault Mirage

The third production F-4K, or Phantom FG.1 as it was designated in FAA service, XT859 made its first flight in the USA on January 1, 1968, and was delivered to Intensive Flying Trials Unit No 700P Sqn at RNAS Yeovilton wearing the codes "725/VL" on May 21 the same year. Artwork by JUANITA FRANZI / AERO ILLUSTRATIONS © 2018



PHILIP JARRETT COLLECTION

ABOVE ***When the Hawker Siddeley P.1154 was cancelled in February 1965, the RAF followed the Royal Navy's lead and also selected the Phantom, the RAF version being designated F-4M by McDonnell. The first of the two YF-4M prototypes, XT852, is seen here on the ramp at McDonnell's St Louis factory; it first flew on February 17, 1967.***

IV bomber). Crucially, there was "little chance of redeploying the resources now employed by Rolls-Royce in such a way as to earn as much, let alone more, foreign exchange".

Cancellation would save £100m but at a dollar cost of £75m. The Spey-powered Phantom would eventually come up to specification but not so much as to justify fully increased costs purely on "military grounds". But perhaps the clinching argument was the fear of dependence in a key military technology. To take up the J79 option would, in the official view, "make us critically dependent on the USA for our future aero-engine requirements. This would have serious political, as well as industrial, consequences. From the point of view of the national interest as a whole, there is a very strong case for retaining the Spey."[18]

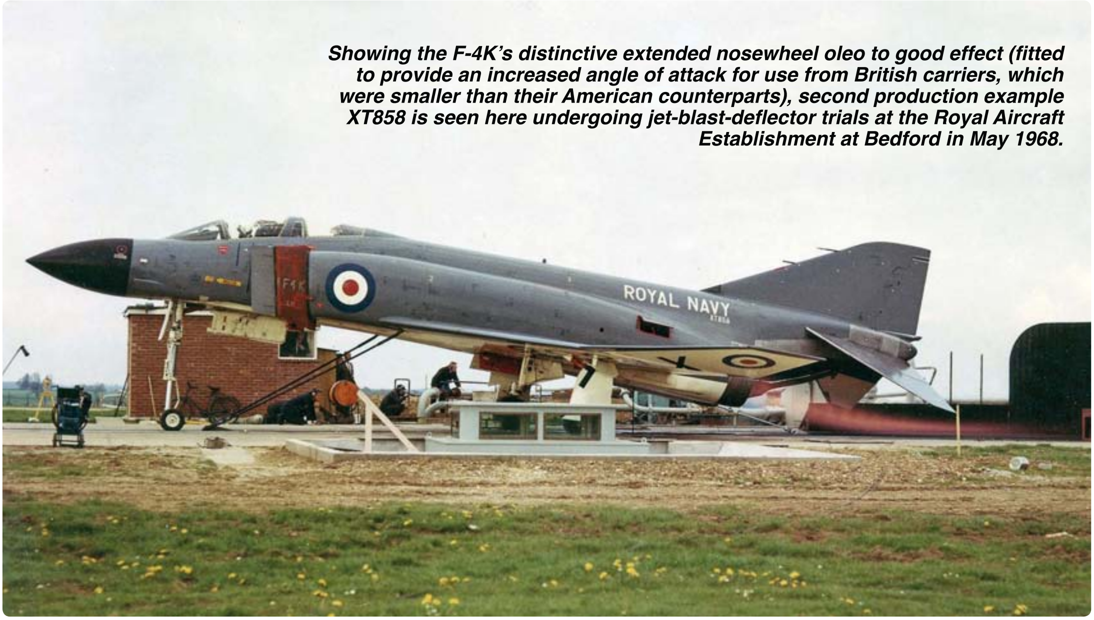
On November 17, 1965, Jenkins told the House of Commons: "While the costs are substantially above those inherited from the Conservatives, we have decided in the interests of industry and [Rolls-Royce] to go ahead with this proposal".[19]

In February 1966 the government finally published its Defence Review, which recalled British forces from "East of Suez" and cancelled development of the ambitious CVA-01 carrier project. Instead, *HMS Ark Royal* was to be refitted in order to take the Phantom. Even this was called into question as cost estimates continued to increase. Ultimately however, the Spey Phantom may have been a beneficiary of continued confusion in UK military aerospace planning.

Central to these plans were the hopes attached to further collaboration with the French. The AFVG was a more advanced partner to the Jaguar, specified in a deal signed by the British and French in 1965. Crucially, the AFVG project was "led" by the UK and offered a platform for British variable-geometry-wing technology. Healey told the House of Commons in February 1967 that "without this project there would be no design work for British industry after work on Concorde finishes, and without that design work there [will] be no future for the aircraft industry not only in Britain, but in Europe. That is the sense in which this is the core of our long-term aircraft programme".

Four months later the French baled out of the AFVG project in favour of a domestic venture. The collapse left the Labour government in an embarrassing position. The Conservatives asserted that the government had put all of its aircraft eggs in the "collaborative basket". Having railed against previous spendthrift Tory defence ministers, Labour had now spent some £250m on cancelled projects. There was no hiding the fact that the government, and Healey personally, had been thoroughly discomfited by the AFVG affair.[20] As Cabinet Secretary Sir Burke Trend wryly observed: "Taken with the Spey Phantom report and the financial troubles, [the situation] is depressing."[21]

The loss of the AFVG project was followed in July 1968 by the RAF cancellation of the F-111 —



Showing the F-4K's distinctive extended nosewheel oleo to good effect (fitted to provide an increased angle of attack for use from British carriers, which were smaller than their American counterparts), second production example XT858 is seen here undergoing jet-blast-deflector trials at the Royal Aircraft Establishment at Bedford in May 1968.

PHILIP JARRETT COLLECTION

another victim of the "East of Suez" cuts. While the loss of the F-111 was somewhat compensated for by orders for an uprated Blackburn/Hawker Siddeley Buccaneer, the RAF was left with a sizeable gap in its air-defence-fighter and strike capabilities. In time the European consortium Panavia's Tornado (launched as the Multi-Role Combat Aircraft — MRCA — in 1969) would eventually meet this need; but for the interim the Phantom was now even more central to UK defence requirements for the early to mid-1970s.

More costs & technical headaches

Although it escaped the 1966–67 defence cuts, the "Anglicised" Phantom continued to give cause for concern. The supersonic Spey suffered from major development problems, especially in respect of its reheat functions. This problem largely stemmed from the Spey being a low-bypass turbofan engine, which required even more costly development.[22]

The death of Adrian Lombard, Rolls-Royce's gifted Technical Director, had undoubtedly added to the company's problems in getting the programme back on track. With the Spey now a year behind schedule in completing type approval tests, the Controller Military Aircraft at the Ministry of Technology (MinTech) was moved to complain directly to Denning Pearson, Rolls-Royce's Chief Executive, in early 1968. It was pointed out that a large part of the increased cost was attributable to "the original decision to adopt the Spey engine, and you will no doubt recall the arguments and assurances deployed by your company, when in 1965 that decision came under review. It is against that background that the continuing shortfalls in your company's performance must and will be viewed, and I cannot emphasise too strongly how seriously the present situation is regarded by this Ministry and the Ministry of Defence". The letter ended with a sharp request to sort matters out as quickly as possible. Pearson's reply asserted that the company was now on top of matters, and every

BELOW *Phantom FG.1 XT859 of Royal Navy trials unit No 700P Sqn is run up to full power before taking off to perform a blistering routine at an air display in October 1968. A number of the unit's Phantoms had their fins emblazoned with a red-orange diamond containing McDonnell technical artist Tony Wong's "Spook" caricature.*

MIKE HOOKS

The RAF initially used the Phantom in two distinct roles; the FG.1 was a dedicated air-defence interceptor and the FGR.2 was tasked with the ground-attack and tactical reconnaissance roles. This FGR.2, XV394, is seen here in January 1969 at RAF Coningsby, where it operated with No 228 Operational Conversion Unit.

MIKE HOOKS

effort was being made to recover the delay.[23] Nevertheless, initial deliveries of the aircraft would have engines below specification.[24]

The Ferranti radar was in some respects giving even more grounds for concern, having suffered 12 months' slippage in development. Matters were not helped by a dispute between Ferranti and McDonnell Douglas, the former being prime contractor responsible for integrating the British radar into the airframe. In part this was due to differences in procurement practices, but it also reflected the wider problem of adapting a foreign design. Overall, the premium for "Anglicisation" had now reached 100 per cent, and without any of the promised performance gains. As a MinTech official noted: "Experience with the Phantom illustrates how difficult and costly it is to introduce major changes in weapons systems bought from abroad by incorporating UK equipment".[25]

Too late to stop

In 1968 the Phantom programme was the subject of a highly critical report by the Comptroller & Auditor General, which triggered a scathing House of Commons Public Accounts Committee review. Sir Ronald Melville, MinTech's Permanent Secretary, admitted that costs had increased, but were justified by the lifetime reduction in dollar costs and, most importantly, "as far as [MinTech] is concerned we have a strong industrial reason for maintaining Rolls-Royce as a British organisation which is powerful industrially and can export".[26]

In any case, the die was already cast; a Cabinet meeting in January 1968 had effectively decided that there was nothing to be saved from cancelling the Spey Phantom. Indeed there was a somewhat resigned statement from Healey about the general state of aircraft procurement:

"Given the commitments that we now plan to maintain, we could phase out the carrier force and sea-based fixed-wing aircraft when we [leave] the Far East and the Persian Gulf, although it might be cheaper to complete the refit of *HMS Ark Royal* which [is] already in hand and phase out *HMS Eagle* instead; it would not now be worthwhile to cancel the order for naval Phantom aircraft. The RAF [will] retain its Harrier aircraft; and it would not now be economical to cancel any RAF Phantoms. We should, however, decide not to develop an alternative to the AFVG, since no collaborative project [seems] likely."[27]

The Chancellor of the Exchequer, James Callaghan, reluctantly conceded that cancelling the Phantom would be the least effective means of saving money from a number of programmes, including Concorde, but he noted in passing that the experience with the "Polaris and Phantom programmes demonstrated clearly the risks that were involved in becoming committed to very large projects. If these escalated in cost, or if it became necessary to make reductions in the defence programme, the cancellation of such projects did not produce large savings once they were well under way".[28]

By May 1968 the public furore had died down. Healey reported to Wilson that, "in general, [the] situation has improved, and is well under control". The Spey still had issues, but had reached an acceptable level of performance and modifications to achieve close-to-final standards were under way. However, there had been further slippage in the radar programme, and as a result the first 90 aircraft in service would have "standby equipment" built to Hunter-level ground-attack capability. It was planned that all of these would have been refitted with new radars by May

ABOVE ***Streaming vortices from the wingtips and with full afterburner applied, XT868 "153/VL" of No 767 Sqn makes a noisy departure from Yeovilton in 1969. The open auxiliary air door in the fuselage forward of the exhaust was fitted only to Spey-powered Phantoms and automatically opened at air speeds below 210kt to aid airflow.***

1970. Development costs for the Phantom now stood at £125m. Production costs had also been affected by the 1967 sterling devaluation and unit costs were now £1·4m for the naval aircraft and £1·55m for the RAF examples. But in general, the aircraft would "probably not meet most of the specification required and was a clear example of why not to adapt foreign purchases". In a note to the Prime Minister, Sir Solly Zuckerman, the government's chief scientific adviser, summarised the final Phantom bill as likely to reach £500m including production, with some £125m being accounted for by R&D.[29]

Even this proved rather sanguine, with Denis Healey reporting in March 1969 that while the aircraft had entered service with "a very good press", the Ferranti issue had "grown worse". The promised radar retrofit had slipped to the middle of 1970 and carrier operations would be initially limited by the fact that the aircraft was unsafe for an engine-out landing. This could cost another £1·25m to resolve.

It was also evident that in terms of maximum speed, ceiling and range, the Spey would "fall short of the performance expected". The reheat function was proving stubbornly problematic: "This is a very serious operational shortcoming indeed, especially in the fighter role for which the Phantom is intended in its later years". An improvement programme would cost £35m and take 4½ years to develop and retrofit.[30]

Worth it?

So was the "Anglicised" Phantom such a bad deal? In total, 118 Phantoms were supplied to the RAF and 48 to the Fleet Air Arm. For all its supposed

The Phantom FG.1 air-defence interceptor variant entered RAF service with No 43 Sqn at Leuchars in September 1969. This example, XV574, wears the unit's distinctive chequerboard marking around the roundel and its "Fighting Cocks" fin badge. Artwork by JUANITA FRANZI / AERO ILLUSTRATIONS © 2018

1 Memo to Prime Minister (PM) Harold Wilson, May 1, 1968. The UK National Archives (TNA) ref PREM 13/19
2 Minister of Defence Duncan Sandys' Defence Review of 1957 has been blamed for a swathe of cancelled aircraft projects. Reality was more complicated, but a premature switch to guided-weapons offense and defence left gaps in capability when strategic priorities changed in the early 1960s. See the author's *Kill or Cure? The 1957 Defence White Paper* in *The Aviation Historian, Issue 19,* April 2017
3 This estimate was carried over into the Labour administration. Memo to PM from No 10 Office, May 11, 1965, PREM 13/1
4 Air Ministry and Ministry of Aviation (MoA) notes, June 22 & September 23, 1964, DEFE 69/318
5 Memo to PM from Secretary of State for Defence, October 1964, TNA ref PREM 13/1; Cabinet minutes, February 1, 1965, CAB/128/39
6 The sudden rise in costs led the PM later to request an internal inquiry, conducted by John Diamond, Chief Secretary of the Treasury; *Report on Spey/Phantom*, August 26, 1965, PREM 13/1
7 Ibid
8 MoA memo, March 25, 1965; memo to the PM, July 14, 1965, PREM 13/1
9 Note to PM from Ministry of Defence (MoD), *Participation by British Industry in the Phantom and Hercules Programme*, May 6, 1965, PREM 13/1
10 Ministry of Technology (MinTech) memo to PM, May 6, 1965, PREM 13/1. MinTech was a new creation, and would shortly absorb the larger MoA. Cousins would be replaced by Tony Benn following the 1966 General Election
11 MoD note to No 10 Office, June 11, 1965, PREM 13/1
12 Wigg was Harold Wilson's "fixer", and had highlighted the previous government's wasteful defence and aerospace projects. Note to PM, June 11, 1965, PREM 13/1
13 Memo to PM from No 10 office, June 11, 1965, PREM 13/1
14 Secretary of State for Defence note to Minister of Aviation, September 15,1965; Minister of Aviation reply September 20; note to PM from No 10 office, November 16, 1965, PREM 13/1
15 MoA comments on McDonnell brochure of F-4K/M alternatives, September 14, 1965, AVIA 65/1749
16 Note by Controller of Aircraft, November 3, 1965, AVIA 65/1749
17 Jenkins was also encouraged by his officials to suggest to Rolls-Royce that it should emphasise the industrial implications of cancellation. Exchange of letters between Secretary of State for Defence and Minister of Aviation, September 15 & 20, 1965; MoA note October 20, 1965, AVIA 65/1749
18 Note to PM from No 10 office, November 16, 1965, PREM 13/1
19 House of Commons debates, November 17, 1965
20 Hayward, Keith, *The British Aircraft Industry* (Manchester University Press, 1989), p111
21 Sir Burke Trend, handwritten comment on note by Sir Solly Zuckerman, Chief Scientist, "Anglo-French Co-operation in the Aircraft Field", September 25, 1967, CAB 164/351
22 My thanks to David Marshall for this technical detail and for a later observation about the long-term value of the Spey programme
23 Controller of Aircraft, MinTech, March 12, 1968; letter from Denning Pearson, March 23, 1968, AVIA 65/1749
24 Memo to PM from Secretary of State for Defence, September 25, 1967, PREM 13/2485
25 MinTech note, October 9, 1967, PREM 13/2485
26 House of Commons Public Accounts Committee, Session 1968–69, HC 362, Q 428
27 Minutes of Cabinet meeting, January 12, 1968, CAB/128/43
28 Ibid
29 Memo to PM from Secretary of State for Defence, May 1, 1968; memo to PM from Chief Scientist, May 7, 1968, PREM 13/2485
30 Memo to PM from Secretary of State for Defence, March 13, 1969, PREM 13/2485
31 I am grateful to members of the Royal Aeronautical Society Air Power Group Iain McNicoll and Peter Gray for these insights
32 On the other hand, the French turned down a "Spey-Mirage" proposal
33 Initial deliveries of Tornado ADV had cement in the nose — designated *Blue Circle* (a British brand of cement) by one wag!

limitations, the Phantom filled a key deficiency in UK defence — and, as a pure strike-fighter, Britain did not have better until the Eurofighter Typhoon came along. The Spey Phantom's low-level performance was in fact superior to that of contemporary off-the-shelf aircraft, and the British-equipped Phantom was faster and more manœuvrable. In addition, the "smoke-free" approach provided by the Spey at low level represented a key operational advantage.[31]

As an instrument of industrial policy, the Spey must be regarded as success — the military Spey formed the core of the Allison TF41 engine fitted to the US Navy's Ling-Temco-Vought A-7 Corsair II. The TF41 was a direct spin-off from the Phantom's Spey, offering a huge prize for Rolls-Royce in gaining access to the American market and an increasing stake in the USA's military engine sector.[32] The Spey helped Rolls-Royce to fill a developmental gap until later collaborative engines came along. The same could be said for the UK avionics sector, although Ferranti would suffer further embarrassment with the late delivery of radar equipment for the Tornado Air Defence Variant (ADV).[33]

Regarding the Spey Phantom offering value for money in terms of procurement, the conclusions have to be rather less positive. The costs of incorporating British elements were excessive, and the approach was — thankfully — never to be repeated on anything like the scale of the Spey Phantom.

FILL 'ER UP!

FLIGHT REFUELLING LTD'S HANDLEY PAGE HARROW EXPERIMENTS, 1938–40

In 1939 three Handley Page Harrows operated by Sir Alan Cobham's Flight Refuelling Ltd, in combination with two Imperial Airways Short Empire Flying Boats, completed the world's first commercial service employing inflight refuelling; **BRIAN GARDNER** profiles the use of the Harrows and the part they played in pioneering aerial refuelling techniques

FOLLOWING HIS unsuccessful attempt in September 1934 to fly non-stop to India with the aid of refuelling in flight, Sir Alan Cobham (**INSET, RIGHT**) was determined not to waste the considerable time, effort and money expended in refuelling experiments over the previous two years. Accordingly, he established Flight Refuelling Ltd (FRL) in October 1934 "to promote and encourage the refuelling of aircraft while in flight".[1] After completing the 1935 display season with his National Aviation Day (NAD) company, Cobham sold off the latter and its aircraft and decided to "settle down . . . to the serious business of refuelling in flight".[2]

Based at Ford in Sussex and employing several of the NAD team of pilots and engineers, FRL used a variety of aircraft to experiment with methods of making contact between aircraft and passing fuel. In September 1935 Cobham produced a report for Imperial Airways Ltd (IAL), explaining the background to his experiments, the advantages of refuelling in flight on commercial services and offering FRL's facilities to develop the idea for airline use.

After considering Cobham's experiments, IAL contacted him with a view to adopting his refuelling methods to its requirements. An agreement was brokered for a partnership between FRL and IAL for the purpose of "furthering the development of refuelling of aircraft in flight".[3] With a more secure backing, FRL continued to undertake experiments with Vickers Virginias and other aircraft on loan from the Air Ministry.

CRACKING THE NORTH ATLANTIC

During the early 1930s several nations were planning air services across the North Atlantic, despite there being no aircraft at that time capable of achieving the crossing between Ireland and Newfoundland with a commercial payload. For political and commercial reasons, the British government refused or delayed foreign applications for air services using British or Commonwealth facilities, and an agreement was reached between the USA's Pan American Airways and IAL that neither would commence North Atlantic services until the other was also ready. Pressing the case for refuelling in flight to increase payload and range, Cobham urged IAL to employ the operation to achieve a commercial air service across the North Atlantic.

Meanwhile, a fleet of Short S.23 "C-Class" Empire Flying Boats had been ordered by IAL for its medium-range Empire routes, but these would not be capable of making the Atlantic crossing unless all disposable load was devoted to fuel. Two aircraft were modified with additional fuel and oil tanks for surveying North Atlantic routes, and in late 1936 IAL agreed to Cobham's proposal that one of these be adapted for inflight refuelling. Accordingly, S.23 Empire Flying Boat G-ADUV *Cambria* was modified for flight-refuelling trials, which were undertaken in January 1938 with the Armstrong Whitworth AW.23 bomber-transport prototype, K3585, acting as tanker. The crossover contacting method, developed by Richard Atcherley at Farnborough, was used.

During 1938 IAL went ahead with planning and preparation for a flight-refuelled trans-atlantic airmail service. As a result, four improved S.30 Empire Flying Boats were equipped with flight-refuelling receiver equipment, although only two — G-AFCU *Cabot* and G-AFCV *Caribou* — were used on this service, being fully modified with strengthened hulls and additional fuel tankage.

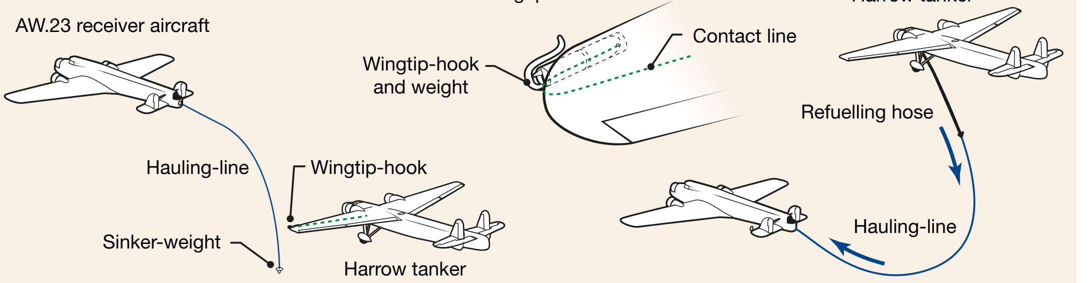
It was assumed by FRL that Imperial would loan suitable aircraft for use as tankers, but as none was available, several alternatives were considered, including the construction of a purpose-built tanker aircraft. Cobham then requested permission from the Air Ministry to use an Armstrong Whitworth Whitley or Handley Page Harrow. On April 26, 1938, he and FRL's chief pilot Hugh C. Johnson flew Harrow II K7031 and decided it would make a satisfactory tanker. Consequently, three RAF Harrows were lent to FRL for refuelling tests and use on the transatlantic service. Accordingly, K7029 went to FRL in April 1938, K6933 in October and K7027 in February 1939, the three Harrows being given the civil registrations G-AFRG, 'FRH and 'FRL respectively.

TO THE EMERALD ISLE

As Rineanna Airport (Shannon) in County Clare, western Ireland, would be the easternmost refuelling base for the transatlantic service, Cobham and Johnson visited the airport in October 1938 to assess the state of its runway,

OPPOSITE PAGE ***Handley Page Harrow tanker G-AFRL feeds Short S.30 G-AFCU* Cabot *with fuel over the South Coast during trials in the summer of 1939. The "Ejector" method of contact developed by Flight Refuelling was sometimes referred to as "cow and calf", whereby the tanker was the cow and the receiver the calf.*** A FLYING HISTORY LTD

THE "WINGTIP" METHOD



Hauling-line from AW.23 snags wingtip-hook of Harrow; hook (attached to contact-line running beneath wing to Harrow cabin), sinker-weight and hauling-line drop free, to be hauled aboard Harrow; refuelling line attached to hauling-line and winched back to AW.23, which refuels and disconnects refuelling line when full; refuelling line hauled back aboard Harrow

accommodation, communications and weather-forecasting facilities. Tanker requirements were also discussed with Cdr T. Driscoll, the Irish Director of Civil Aviation.

In combination with the AW.23, the Harrows were used for testing contacting and refuelling methods in both receiver and tanker roles, and, after several potentially hazardous methods were tried, FRL produced a wingtip-contacting system. This involved the tanker flying into a weighted hauling-line trailed from the receiver and contacting it with the tanker's port or starboard wing's leading edge. The tanker was then manœuvred to slide the line outboard along the leading edge into a weighted-hook device at the wingtip. The hook was withdrawn and hook, lines and sinker-weight dropped clear of the aircraft. The hauling-line was then winched into the tanker where it was attached to the hose nozzle. While the tanker climbed above the receiver, the receiver operator winched line and hose across. As the line was led through the centre of the reception coupling, it drew the nozzle into engagement, where it was secured by hydraulically operated toggles. Fuel was fed under gravity at 180–200gal/min.

The Harrow carried a total of 960gal of transferrable fuel in five wing tanks and two fuselage tanks, and a 150gal fuselage tank was provided for the tanker's supply. A two-speed manually operated winch was provided for winding in the hose after refuelling, and the fabric covering of the forward fuselage was replaced by transparent panels to enable the operators to watch the operation and signal, by means of flags, to the operator in the receiver.

POSITIONING THE HARROWS

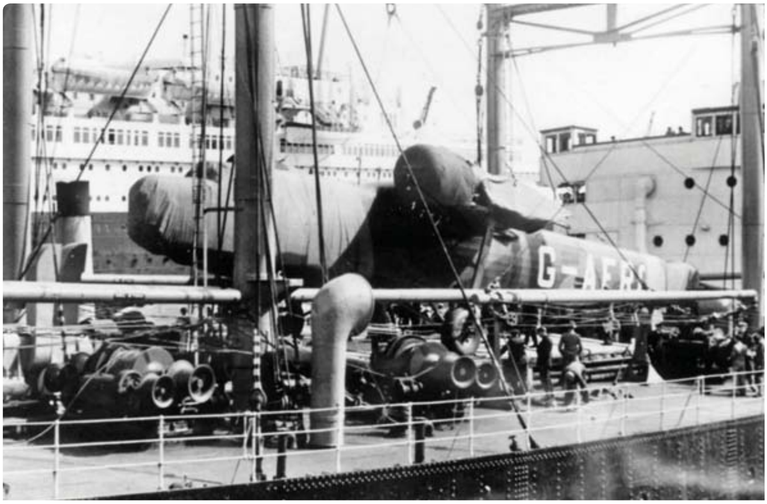
Harrows G-AFRG and 'FRH would be based at Hattie's Camp at Gander, Newfoundland, and these left Southampton aboard the Canadian Pacific freighter *SS Beaverford* on April 14, 1939. The wings, empennage and propellers were crated, while the fuselage, together with the inner wings, engines and undercarriage went as deck cargo. Also aboard were the two pilots — Hugh Johnson and Flt Lt D.D. Atkinson (second pilot) — and engineer/refuelling operators G.C. Keegan, R.E. Sutherland, A.N. Le Cheminant and B.W. Brennan.

After berthing at Montreal, Quebec, on April 24, the task of unloading the Harrows began. It was intended to load the aircraft aboard two scows and float them down two miles (3·2km) of the St Lawrence River and unload them on to a mole adjacent to Fairchild Aircraft Ltd's airfield at Longueuil. They were to be lifted from the ship on to the scows by a floating crane, and be removed from the scows on to the mole by a 35-ton portable crane.

Due to the late break-up of ice, however, it was necessary to dynamite the ice near the shore so the scows could get alongside. The 35-ton crane was to have been brought by road but the necessary permit was not granted, and it had to come by rail. There was also a delay of several days in towing the scows across the river. Other problems were encountered with unloading, bad weather, ice and a lack of co-operation from the authorities. Eventually a ramp was built from the scow on to the riverbank and the aircraft were manhandled up the mole: "After earth-filling, bridge-building and various other constructional efforts to move the Harrows, they got to Fairchild Field [sic]".[4]

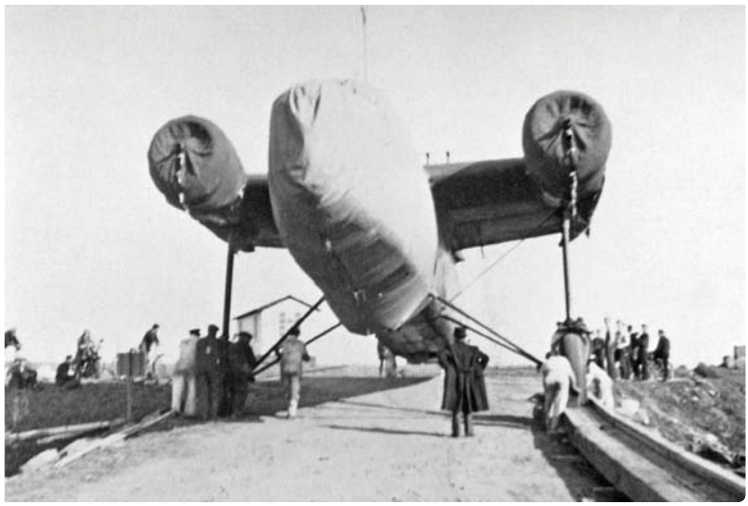
The aircraft were then assembled in the open and completed by about May 11. After delays caused by a boggy field, the aircraft were test-flown on May 17 and departed for Newfoundland the following day. One Harrow reached Newfoundland on May 19, but the other had to return to Montreal owing to a leaking fuselage fuel tank, causing more than 100gal of petrol to enter the fuselage. This aircraft eventually arrived in Newfoundland on May 21.

On arrival, the aircraft were overhauled and the refuelling gear serviced, all of which had been completed by June 15, allowing practice flying to start the next day. Some of the personnel had little or no practice in flight-refuelling operations owing to late changes before leaving the UK.



AUTHOR'S COLLECTION

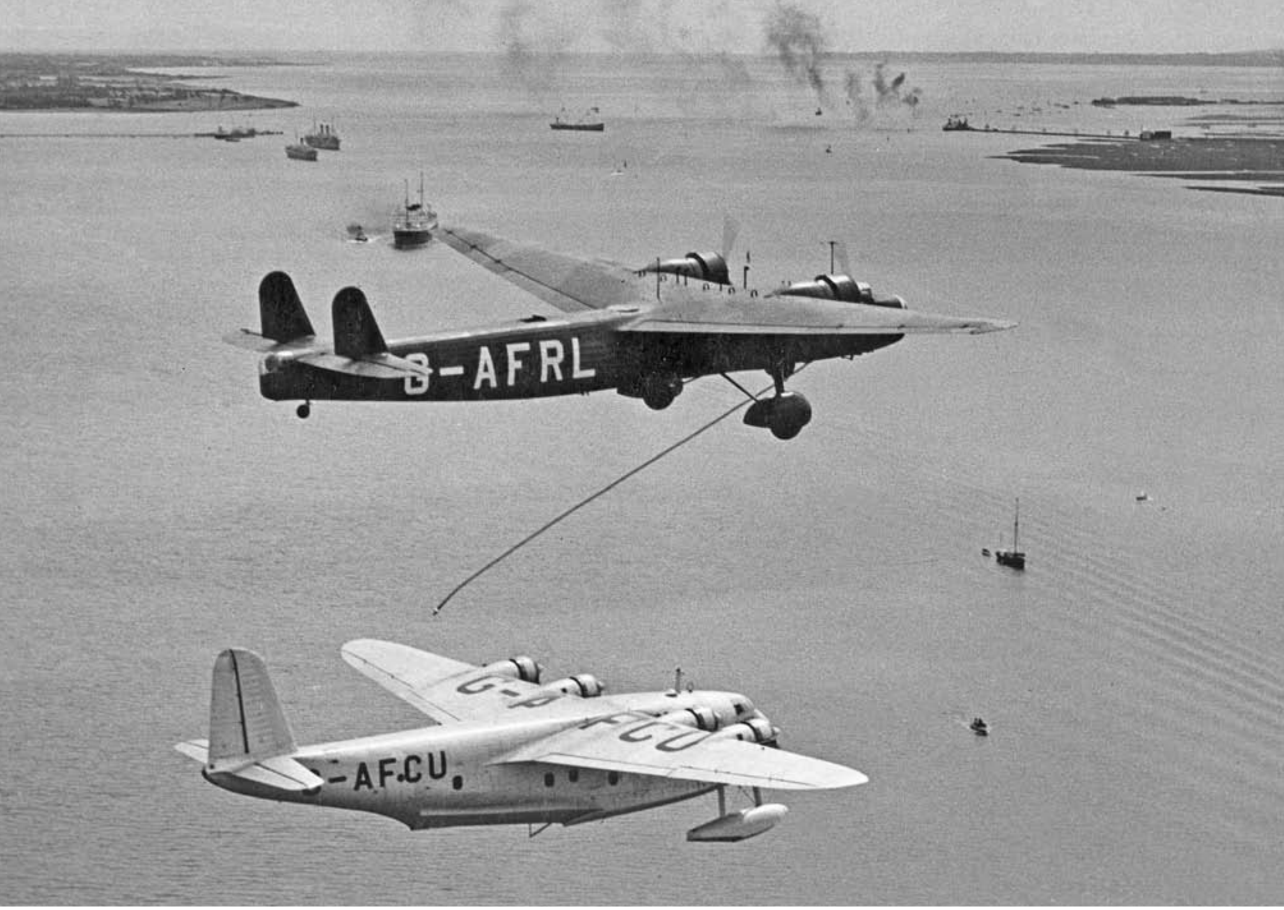
TAH ARCHIVE x 3



CLOCKWISE FROM TOP LEFT ***Anchors aweigh! Harrow G-AFRG minus its outer wings and tail aboard the*** **SS Beaverford** ***bound for Newfoundland in April 1939; Hugh Johnson building part of the ramp to get the aircraft off the scow and up the mole to the airfield at Longueuil; the Harrow towers above the crew at the top of the ramp track; the Harrow's port mainwheel tyre pinches against the side of the ramp track, showing how little room for error there was. Adding to the crew's headaches was the need to find suitable timber with which to make the tracks.***

BELOW ***Flight Refuelling's Harrow G-AFRG after assembly at Fairchild's airfield and factory at Longueuil, near Montreal, in May 1939. Large observation transparencies were incorporated into the Harrows' forward fuselages' fabric covering to give the operators the field of vision required to undertake the inflight refuelling operation.***

PHILIP JARRETT COLLECTION



PHILIP JARRETT COLLECTION

ABOVE ***Steady as she goes — Harrow G-AFRL remained in the UK and undertook further development trials with Short S.30 G-AFCU*** **Cabot** ***during June–July 1939. Flight Refuelling issued a guarantee of "service in any part of the world to deliver 1,000gal of fuel in 10min, at speeds with existing equipment ranging from 110 to 125 m.p.h."***

Problems were immediately encountered with the rough runway surface, formed from sharp granite chippings "all set on edge".[5] A Harrow tailwheel lasted only three landings and the "kiss-touch" with the type's large wheels was so severe that huge lumps of rubber were ripped out on each landing. Spare wheels were quickly used up and flying was delayed until the arrival of further spares. To reduce this heavy wear, arrangements were made to have a portion of the runway rolled, sprayed, tarred and sanded.

One of the Harrows had experienced violent vibration on the flight from Montreal to Newfoundland, but no cause could be found. This was to have been the No 1 tanker, but after the first service it was grounded pending further examination, which found the flaps out of alignment. The second tanker was used for the remaining service flights.

Stores and spares were shipped to Newfoundland so that a completely self-supporting base was established, although not without problems. Transport and accommodation was difficult to arrange and a rail boxcar was eventually hired for use as temporary accommodation.

The third Harrow, G-AFRL, remained at Ford for some months, as it could leave for Shannon at a later date, and so was used for further development flying, IAL crew training and final full-load trials of *Cabot*, which were completed at Hythe on July 3. Receiving its Certificate of Airworthiness (CoA) on July 20, 1939, G-AFRL departed for Shannon on August 1. The refuelling base was opened the following day, with Geoffrey Tyson as manager and pilot, together with three FRL engineers: Percy Allison, Ron Illesley and John Davies.

A NEW METHOD

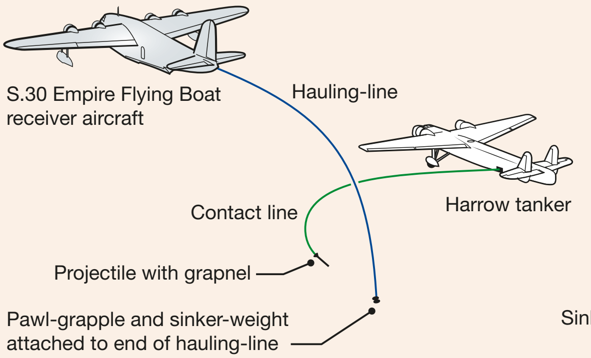
Meanwhile, FRL had developed an improved contacting method in which the receiver's hauling line was engaged by a projectile-and-line fired from the tanker flying alongside and slightly below the receiver. The projectile was aimed to pass below the arc of the receiver's weighted sinker line, to be be blown back by the airflow, contact the line and slide down to be caught in a grapnel. Lines were then winched into the tanker, where the receiver's line was held in a vice while the bayonet coupling was removed from the weight and connected to the hose nozzle. The hose was then winched back to the receiver and secured in the coupling.

THE “EJECTOR” OR “LOOPED-HOSE” METHOD

Illustrated below is the sequence of operations for the “Ejector” or “Looped-Hose” method of refuelling in flight, developed by Flight Refuelling Ltd during 1939–40.

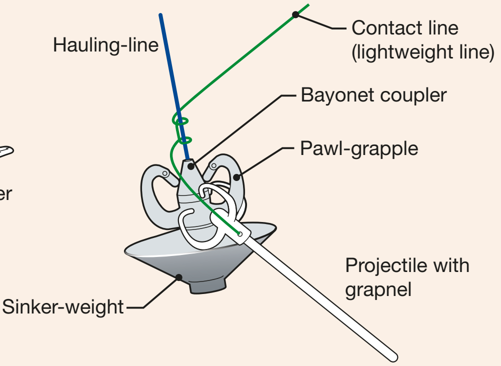
Artwork by JUANITA FRANZI / AERO ILLUSTRATIONS © 2018

1 Receiver aircraft trails its hauling-line. Tanker fires projectile attached to the contact line through arc of hauling-line.

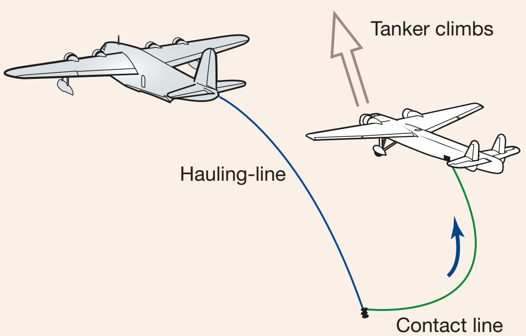


The contact line tangles with the hauling-line and the projectile is snagged by the pawl-grapple.

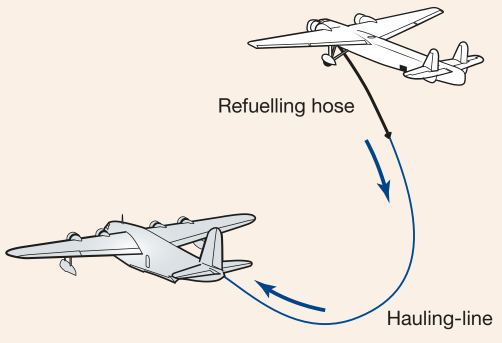
Detail showing projectile grapnel snagged in pawl-grapple



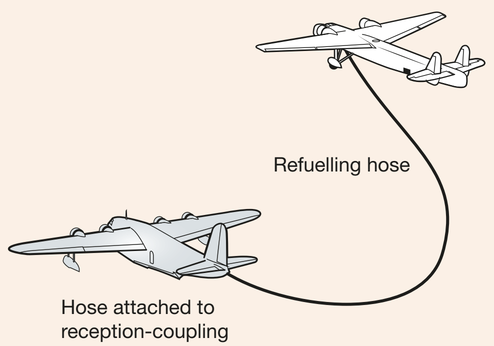
2 When projectile is snagged by pawl-grapple the tanker climbs to the refuelling position and the hauling-line is pulled up into the tanker.



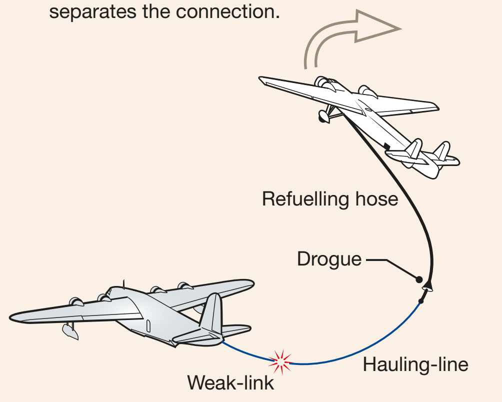
3 The pawl-grapple and sinker-weight are removed inside the tanker and the hose nozzle attached to the bayonet coupler. The refuelling hose is run out from the tanker and the hauling-line is pulled into the receiver aircraft.

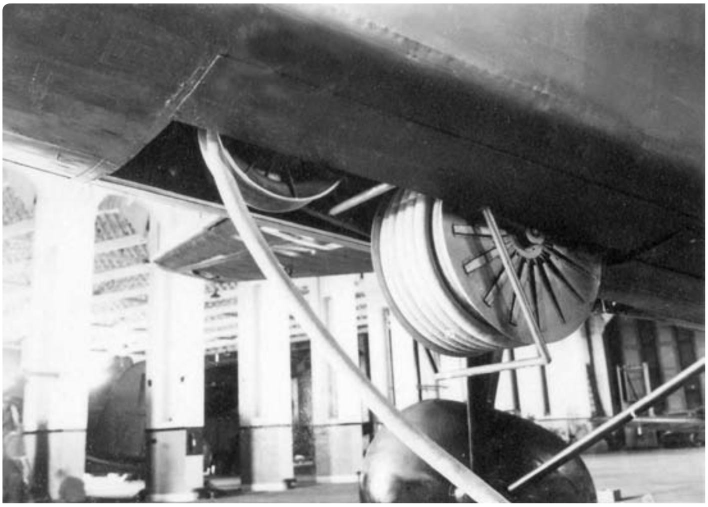


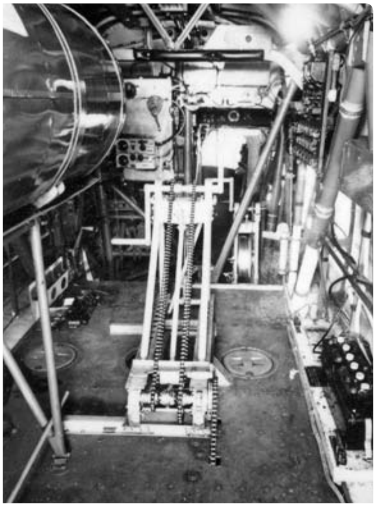
4 The refuelling hose is drawn into the receiver’s reception-coupling and refuelling commences.

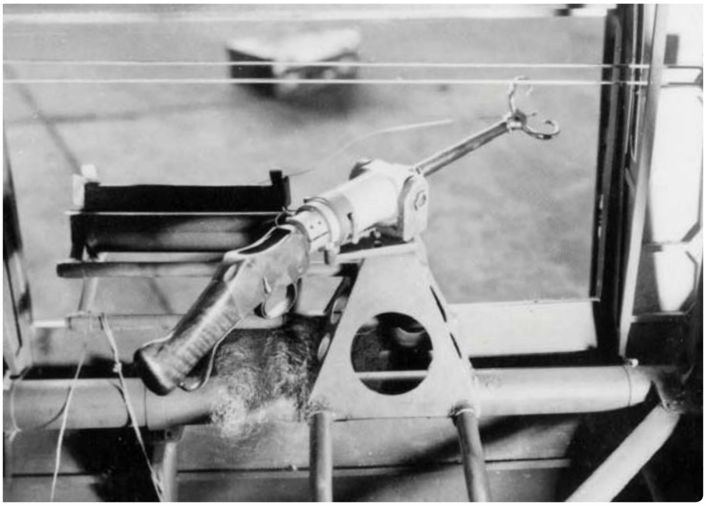


5 When refuelling is complete, the hose is released from the reception-coupling. The tanker turns away and the breaking of the weak-link in the hauling-line separates the connection.







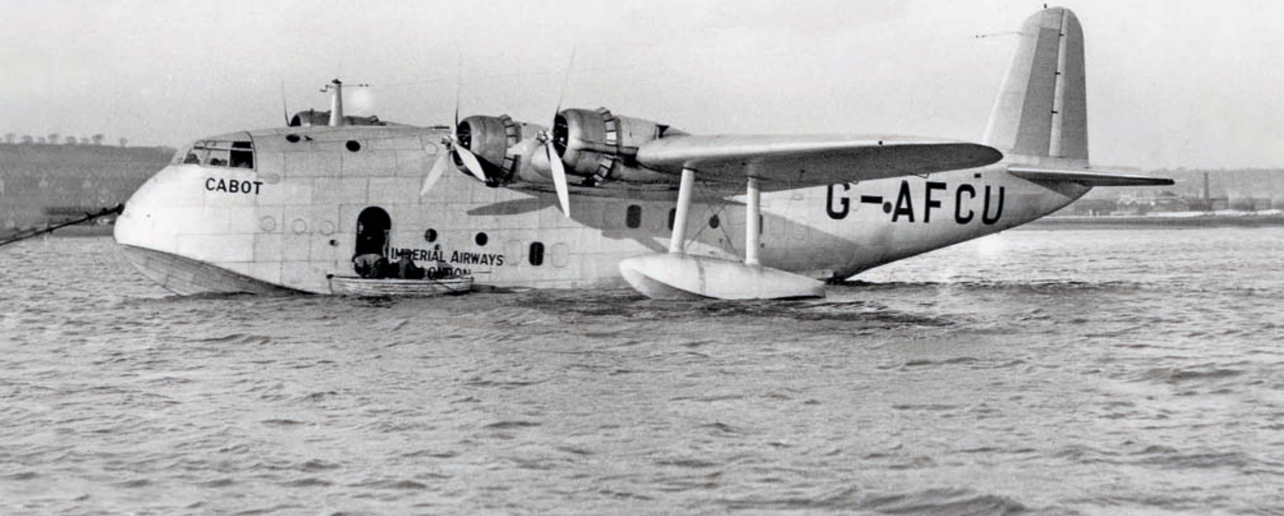


TAH ARCHIVE x 4

CLOCKWISE FROM TOP LEFT ***The fuel-hose twin-reel arrangement in the forward fuselage of one of the Harrows, operated by the larger winch mechanism pictured top right (a smaller winch was used forward of the main winch to play out and withdraw the hauling-line cable); the Birmingham Small Arms Co (BSA) supplied a gun capable of firing a 15in (38cm) steel rod with a grapnel on the end, which would take 300ft (90m) of 5cwt steel cable with it; Hugh Johnson discusses the trials with Pan American's Capt Arthur LaPorte in Newfoundland in June 1939.***

BELOW ***Along with G-AFCV*** **Caribou*****, Short S.30 G-AFCU*** **Cabot** ***was used on the 16 transatlantic airmail crossings using inflight refuelling undertaken between August 5 and September 30, 1939. On the outbound flight to New York on September 24,*** **Cabot** ***established a new record for the run between Foynes and Botwood, taking 13hr 2min.***

TAH ARCHIVE



TAH ARCHIVE

ABOVE ***With the legend "REFUELLING" emblazoned in large white letters across the top surface of its wing so as to avoid any confusion about its purpose, Harrow G-AFRG heads out over Newfoundland for another sortie. An average refuelling sortie would take around 15min to complete and would involve the transfer of some 850–950gal.***

Trials for the transatlantic service had been undertaken using the wingtip method, but, following the success of the "Ejector" (also known as "Looped Hose") method described above, the company decided to modify the Harrows in time for the service. The FRL team had sailed for Canada before the Ejector line-throwing method was perfected, but by June 1939 the new method was considered superior to the wingtip method, and two sets of equipment, together with instructions, were sent out for the Newfoundland aircraft. These were installed, and the wingtip hook equipment removed, before the start of the service. The third Harrow was so modified before departing for Shannon.

The intention of refuelling the Empire flying-boats was to enable a commercial payload to be carried, but the 8,000lb (3,600kg) difference between the type's original take-off weight of 45,000lb (20,400kg), and maximum in-flight weight after refuelling of 53,000lb (24,000kg), was gradually eroded by increases in authorised take-off weight. Following successful fuel-jettison tests, the Empire flying-boats' take-off weight was increased to 48,000lb (21,800kg), and in July 1939 *Caribou* was cleared for a maximum take-off weight of 50,500lb (22,900kg) and an alighting weight of 48,000lb.

ENTER THE AIRMAIL SERVICE

After numerous delays caused by modifications, engine tests, refuelling tests, jettison tests and CoA tests, Imperial's transatlantic airmail service began on August 5, 1939, with G-AFCV *Caribou* captained by John Kelly-Rogers. Approximately 1,000lb (450kg) of mail — about 25,000 letters — was carried and a special airmail envelope was issued to commemorate the service. No passengers were carried.

The route from Hythe to New York went via Foynes (Shannon), Botwood (Newfoundland) and Montreal, with refuelling taking place after take-off from Foynes and Botwood. A total of 16 crossings was made, all but one being refuelled by Harrow tankers. The exception occurred on the first eastbound flight. The Harrow took off to meet *Caribou,* but was unable to rendezvous because of adverse weather. With a heavy aircraft and limited wireless facilities, the tanker jettisoned fuel and returned to Hattie's Camp. Meanwhile, *Caribou* was returned to its moorings to wait for an improvement in the weather. Eventually the captain decided to fuel up to the recently-increased weight of 50,500lb and took off 57min late. To avoid the embarrassment of bad publicity, the captain later explained to the press that refuelling was unnecessary on this occasion because of favourable winds.

Although Britain declared war on Germany on September 3, 1939, the transatlantic airmail service continued as planned until the end of September, when it was suspended for the winter owing to icing conditions at Botwood. The final eastbound flight, with Capt Gordon Store and crew in *Cabot*, departed on September 29 and arrived at Poole at 1733hr on the 30th.

Harrow G-AFRL trails its hose during a refuelling exercise in the UK in the summer of 1939. By the time the 16 experimental transatlantic airmail flights had been completed at the end of September 1939,* Cabot *and* Caribou *had transported a total of around 13,000lb (6,000kg) of freight and mail.
PHILIP JARRETT COLLECTION

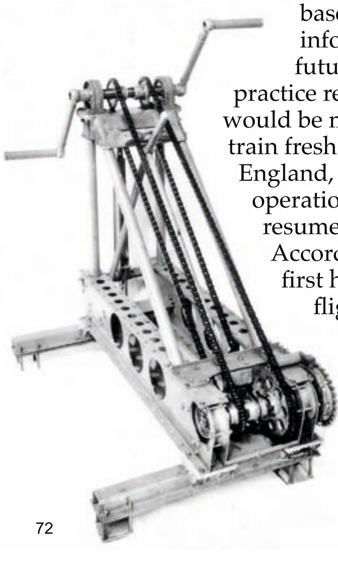
BELOW *The fuel-hose winch bolted to the floor of the Harrows. Marcus Langley, FRL's technical manager, also considered the use of the de Havilland Albatross as a tanker, although whether it would have had sufficient structural integrity to accommodate the equipment required is open to speculation.* TAH ARCHIVE

Although cumbersome, the flight refuelling operations were completed successfully and demonstrated the potential of commercial air refuelling. However, in 1945, when BOAC was again considering refuelling trials, Kelly-Rogers, then Acting Technical Manager, West Atlantic, gave his opinion of the 1939 trials:

"Those of us who did it thought that flight refuelling as practised in 1939 was pretty futile, as it did nothing more nor less than increase the weight of the aircraft shortly after take-off to an amount in excess of that which it could safely alight. In any case, the extra fuel taken aboard was largely consumed in sustaining the aircraft in flight at the increased weight. Furthermore, the performance of the receiving aircraft and of the tanker were not very startling, and in consequence, refuelling was generally carried out at an uncomfortably low altitude and at airspeeds not very much above the stall . . ."[6]

WHAT NEXT FOR THE HARROWS?

After the suspension of the Atlantic airmail service, it was decided to keep the Gander base open and await information regarding future plans. Further practice refuelling flights would be made in order to train fresh personnel from England, so that refuelling operations could be resumed when necessary. Accordingly, during the first half of October, 12 flights were completed for refuelling practice, training and weather observation.



An earlier report by the Air Ministry on the construction costs of the airport at Newfoundland had considered the problem of snow clearance, and concluded that practical experiments would be necessary, using aircraft representative of the landplanes that may require landing at Gander. Of the two principal methods of treating snow — blowing and compacting — it was concluded that blowing would be very costly, and even a restricted experiment could not be justified. It was therefore decided to compact snow on one runway to test the effect of operating a heavy aircraft under varying weather conditions.

It was proposed that the two Harrows based there be used for this purpose and on November 21, 1939, a programme of snow-clearing trials was planned for the winter of 1939–40. These included testing the Harrows on compacted snow, collecting meteorological data, calibrating the main direction-finding (D/F) station at Hattie's Camp to a range of 200 miles (320km) and the local station at Botwood up to 50 miles (80km), and occasional night flights to test the suitability of the airport contact light installation.

As Treasury approval was required for dollar expenditure on these experiments, the requirements were explained in a letter of November 23. On grounds of cost, difficulty of securing sea transport and avoidance of war risks, it was preferable to retain the two Harrows in Newfoundland rather than return them to the UK and possibly have to send them back to Newfoundland in 1940 if further air-refuelled services were to be operated.

These experiments would be useful when considering the design of future commercial aircraft that may operate through Newfoundland. In addition, there was likely to be a direct military interest in using Gander during the winter of 1940, and this would be dependent on results of the snow experiments.

TAH ARCHIVE

ABOVE ***Following the completion of the transatlantic airmail experiment, Harrows G-AFRG and 'FRH remained at Gander to continue inflight refuelling trials in order to keep the crews current in case the service was resumed. With its refuelling equipment still fitted, 'FRH is seen here in October 1939, during which a dozen practice flights were completed.***

Consequently, the experiments were considered essential to determine how the airport could meet a war requirement.

Approval was therefore sought for IAL to conclude this contract for a period ending May 31, 1940. Accordingly, FRL was contracted to operate the Harrows in a series of test flights involving operation from snow-covered runways, calibration of D/F equipment and VHF approaches using a Lorenz set. The two Harrows were hired from October 7, 1939, and the loan period was extended to December 31, 1940. The flights, not to exceed a total of 150hr, would commence as soon as possible and be completed by May 31, 1940. The test results would be made available to the Air Ministry and IAL.

SNOW BUSINESS

In view of this winter programme it was decided to undertake a thorough overhaul of both aircraft and install additional radio equipment. All surplus refuelling equipment was removed and placed in storage. Airframe fabric was renewed where necessary and all fuselage openings, necessary for the refuelling operation, were covered over. The enlarged windows, necessary to give the crew a good view during the refuelling operation, were filled in with perspex or blanked off with plywood, a difficult task owing to the differing configuration of the two aircraft; G-AFRG was the prototype while 'FRH was a production Harrow II.

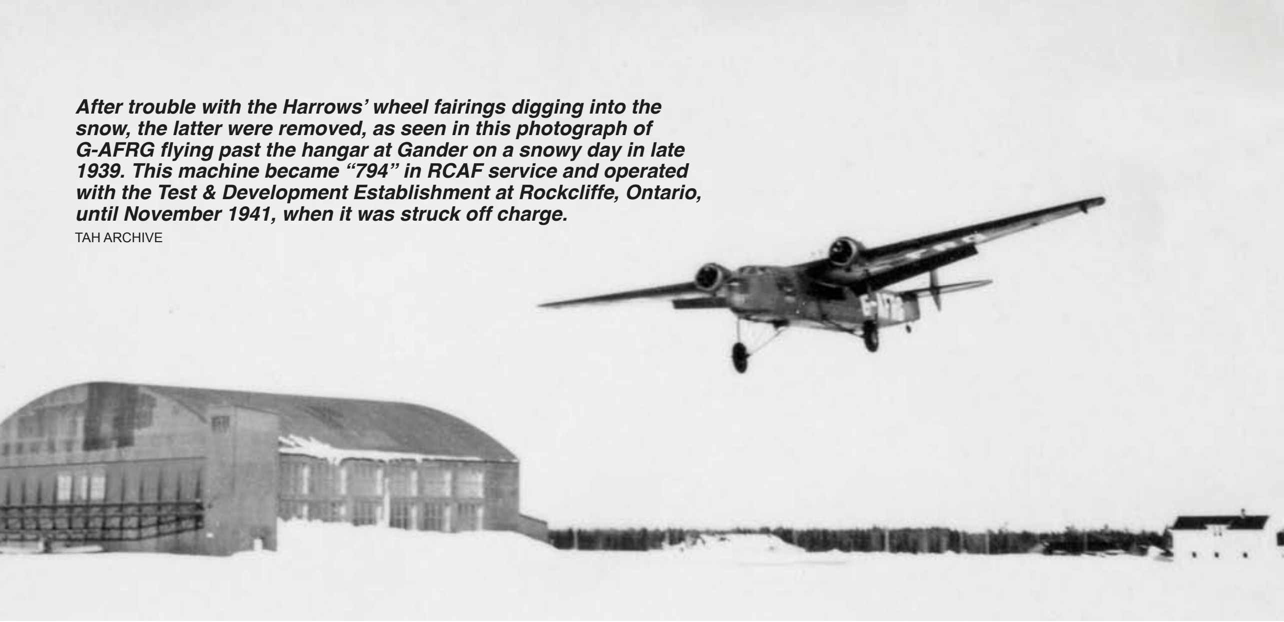
One set of Lorenz blind-landing equipment was provided. As this had to be capable of being fitted to either aircraft, it was mounted on a plywood panel, the complete assembly being slung on shock-absorber cord, located on the starboard side, just aft of the cockpit. The main beacon aerial was fitted to the cabin roof, opposite the standard aerial mast. Radio equipment comprised Marconi 1082 and 1083 units installed on a rack aft of the cockpit. Other special equipment included meteorological instruments, carburettor and propeller anti-icing equipment and flying clothing for the crews.

The first opportunity to operate from a snow-covered runway came on November 28, 1939, and between this date and December 22 the aircraft taxied, took off and landed from uncompacted runways. Other tests involved radio equipment, checking the D/F equipment at Hattie's Camp and testing the blind-landing directional beacons and four marker beacons.

Early in 1940 D/F loop equipment was requested for all three Harrow tankers, intended for use in proposed services later that year, but the request was turned down by the Air Ministry as the equipment would serve no useful purpose in the snow tests. Homing could be achieved from ground D/F stations.

Snow tests continued as conditions permitted up to May 1, 1940, to assess methods of snow treatment and probable costs necessary to make the airport serviceable throughout the winter months. Following operations from uncompacted snow, heavy rollers were used to compact snow for further tests and the aircraft operated from a variety of surfaces, with assessments made of performance and ease of handling. A ski tailskid was fitted to one Harrow for some taxying tests.

Reports on these experiments were submitted to the Air Ministry and to the newly formed BOAC, and provided much useful information on winter operations from Newfoundland airport for use by aircraft making the transatlantic crossing.



After trouble with the Harrows' wheel fairings digging into the snow, the latter were removed, as seen in this photograph of G-AFRG flying past the hangar at Gander on a snowy day in late 1939. This machine became "794" in RCAF service and operated with the Test & Development Establishment at Rockcliffe, Ontario, until November 1941, when it was struck off charge.
TAH ARCHIVE

BELOW *One of the two Harrows at Gander was fitted with a ski tailskid for taxying experiments on the snow. Much of the information gained from the Harrows' trials proved useful for subsequent operations from the airfield, which was used extensively by the RAF and USAAF as a stop for aircraft being ferried to Europe throughout the war.*

It was originally planned to undertake flights for collecting meteorological data on the assumption that the Canadian government would contribute towards the cost, but agreement could not be reached and the meteorological flights were cancelled.

INTO CANADIAN SERVICE

It was hoped to resume British services across the Atlantic in the spring of 1940, as soon as Botwood was clear of ice and open to traffic, but operation of this service would be dependent on the availability of *Cabot* and *Caribou*, which were due to be released for civil duties on March 31, 1940. In the event, they were retained by the RAF.

On April 24, 1940, the Under-Secretary of State for Air, Harold Balfour, stated the following in the House of Commons: "It had been hoped to reopen this important service during the present year. Recent developments have, however, made it necessary to divert the aircraft . . . to certain defence purposes for which they are particularly suited. I regret that at the present time defence needs must claim priority and that it will not, therefore, be possible to operate the service this year". He also stated that consideration would have to be given regarding the two Harrows and FRL personnel in Newfoundland. As hangar space at Newfoundland was severely limited, there was pressure on FRL to dismantle the Harrows and store them in a corner. However, both aircraft were disposed of to the Canadian government, and were transferred to the Royal Canadian Air Force, G-AFRG adopting serial "794", while G-AFRH was reduced to spares.

Both *Cabot* and *Caribou* were impressed into the RAF, as V3137 and V3138 respectively, and used for reconnaissance patrols and transport tasks.

TAH ARCHIVE

In early May 1940 they were spotted by German flying-boats while moored at Bodø in Norway, and were destroyed in an air attack.

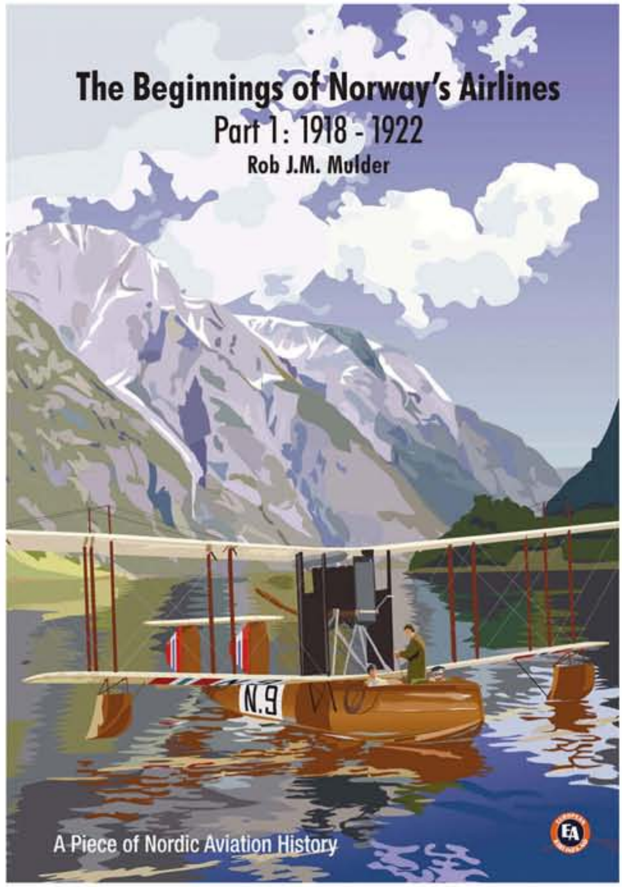
On August 18, 1940, Harrow G-AFRL and the AW.23 (by this time registered G-AFRX) were damaged during an air raid on Ford. They were subsequently dismantled, while another Harrow, K7000, undergoing tanker conversion, was returned to RAF service.

ACKNOWLEDGMENTS *The author would like to thank British Airways Archives, The National Archives and Colin Cruddas, former Cobham archivist, for their invaluable help with the preparation of this article*

1 Cobham, Sir Alan, manuscript of *The Story of Flight Refuelling*, Cobham Archives
2 Ibid
3 British Airways Archives, file AW/1/450 Pt 1, Flight Refuelling General
4 Johnson, H.C., report on Newfoundland base for year ending 31/12/39, Cobham Archives
5 Ibid
6 British Airways Archives file AW/1/452 Pt 4, Flight Refuelling, Aircraft General

1918–2018: 100 YEARS OF NORWEGIAN COMMERCIAL AVIATION

July 10, 2018, marked the centenary of the establishment of Norway's first airline, Det Norske Luftfartrederi (DNL). Operations did not start until 1920, however, when the new company won a bid to operate a service from Stavanger to Bergen via Haugesund. Other companies were not far behind, no fewer than six airlines started operating in Norway between 1918 and 1922 with surplus aircraft from Germany and Great Britain.



This first volume in European Airlines' new series on Norway's airlines takes an in-depth look at the companies formed during 1918–22, including the aircraft imported and the people involved, using numerous photographs, many of which are published here for the first time.

Author: Rob J.M. Mulder
Format: 215x302mm (A4), hardback, 192 pages, 257 photographs, 12 colour profiles, English text
ISBN: 978-82-93450-04-7
Price: £ 34,95 + postage

Aeroplane Monthly (September 2018) gave the book 4 out of 5 stars and wrote:
'The image selection is truly excellent and very well reproduced, on good-quality paper and accompanied by some first-class colour profiles'.

Orders at:
WWW.EUROPEANAIRLINES.NO

R·A·F FAR·EAST·FLIGHT
PART 1: UK—SINGAPORE

In October 1927 four Supermarine Southamptons of the RAF's elite Far East Flight set off from Plymouth on an epic adventure to open up Britain's Empire air routes while also proving the reach and reliability of the Service's flying-boats. TREVOR LIPSCOMBE opens his two-part account of the FEF with its leisurely five-month cruise to Singapore

THE ROYAL AIR Force's Far East Flight of 1927–28 was a landmark "cruise" undertaken by four twin-engined Supermarine Southampton flying-boats from England to Australia via Singapore — truly an adventure into the unknown in an age when the world was a much bigger place. Acclaimed at the time for its achievements, the Far East Flight (FEF) has largely been forgotten, eclipsed by a cloud of more glamorous contemporary aviation adventures. Now, some 90 years later, the FEF provides a timely reminder of the many changes that have occurred in long-distance flying within the span of just one human lifetime.

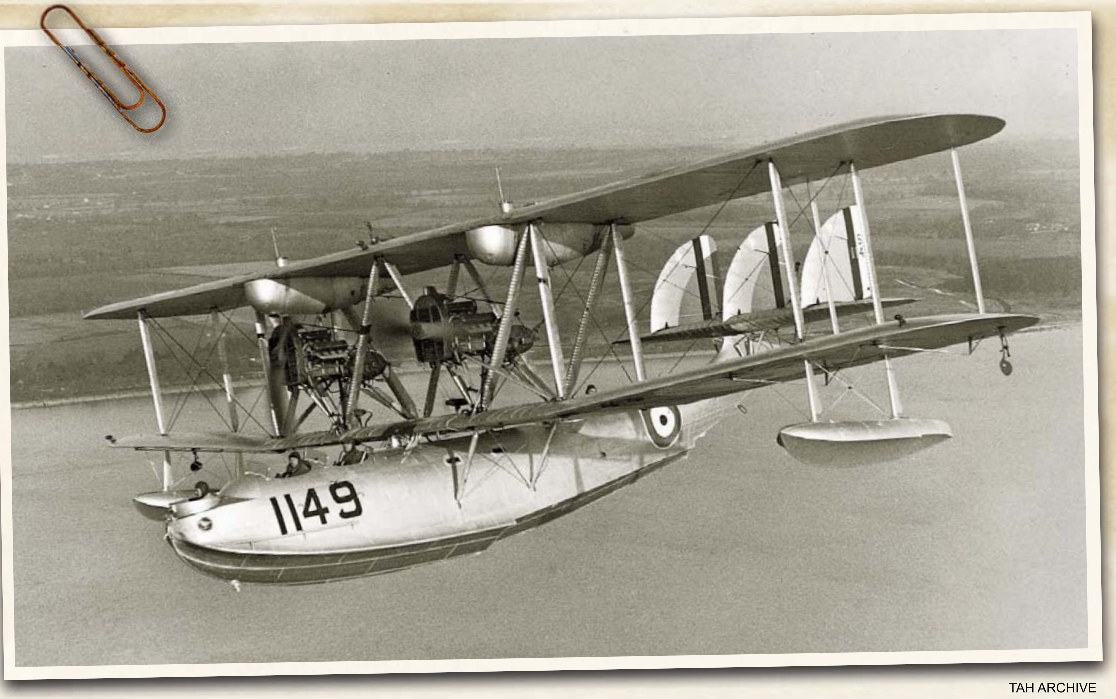
On both sides of the Atlantic, the 1920s and early 1930s were regarded as a "golden age" of flying, when "horizons beckoned with a glamour never found again . . . all the world was waiting to be explored by air", as Harald Penrose put it in *British Aviation: The Adventuring Years* (Putnam, 1973). The idolised celebrities of the day were aviation heroes — Alan Cobham, Charles Lindbergh, Bert Hinkler, Hubert Wilkins, Charles Kingsford Smith and others of many nations — whose world-shrinking feats made headlines in the popular press across the globe. The romance of aviation grasped the imagination of a public traumatised by war and economic upheaval as never before or since.

CASTING A SHADOW

A darker side of this golden age, however, was global political uncertainty, which would culminate in worldwide conflict only 20 years after the "war to end all wars". This renewed fear drove technological development at a frenetic pace in Britain, Europe and the USA, which threatened to change the global balance of military supremacy. In 1925 C.G. Grey, Editor of *The Aeroplane*, having recently visited America, reported with characteristic pungency:

"The US Services regard war with Japan as inevitable . . . Japan is manœuvring to make the Pacific Ocean a Yellow Lake. And America is not going to stand for it . . . the position of Europe is full of uncertainty and incalculable danger. Aerodynamics have transformed the Channel into a ditch devoid of military value . . . if Germany invades France or Belgium, a situation will be created in which Britain would be open to attack by air."

The growing capabilities of aircraft increased fear of the potential large-scale bombing of cities, but also raised horizons and opened up the



TAH ARCHIVE

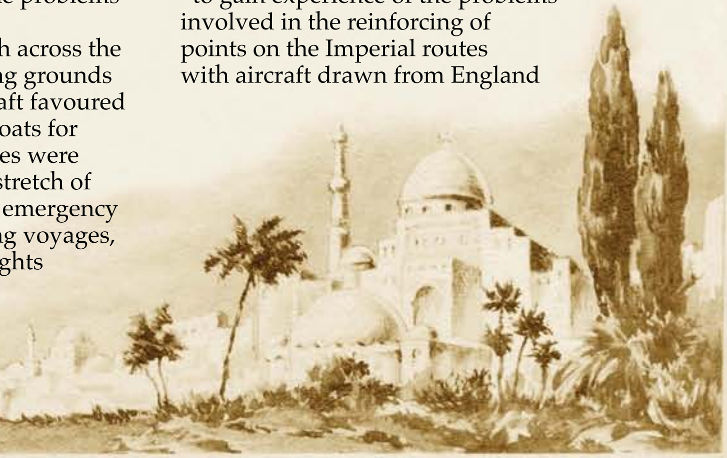
ABOVE ***The Air Ministry initially ordered the wooden-hulled Southampton Mk I "off the drawing board" in August 1924, the first production example making its first flight on March 10, 1925. An anodised light-alloy metal hull was developed for the Mk II, the first of which was S1149, seen here, and which, in company with S1150, S1151 and S1152, served with the FEF.***

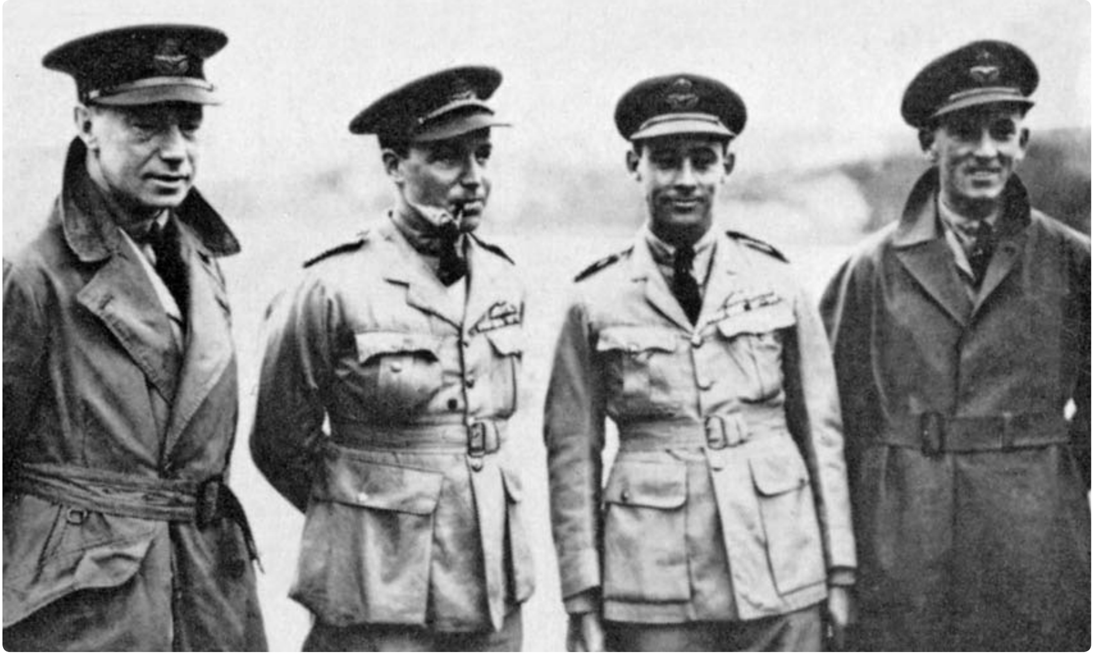
possibility of long-distance mail and passenger services. Britain was concerned with protecting the outposts of its far-flung Empire, and the sea routes connecting it, from hostile air power. At the same time, speedier air travel would shrink the world, facilitate communication and trade and draw distant possessions closer.

In 1921, after his return from a British Empire tour, the Prince of Wales addressed a dinner for Dominion Premiers: "There is no doubt that the future of rapid Imperial inter-communication lies in the air, and I trust that the day is not far distant when civil aviation will have built a great air organisation on the same lines as our mercantile marine, and that delegates of the next Imperial Conference will travel by the air routes now being worked out. The British Empire has more to gain from efficient air communication than any other state in the world, and I feel sure that no time will be lost in solving the problems connected therewith."

As aviation pioneers began to reach across the world in the 1920s, the lack of landing grounds and the general unreliability of aircraft favoured the development and use of flying-boats for this task. Many major towns and cities were on a river or coast, and any smooth stretch of water became a landing place for an emergency alighting. Like the earlier great sailing voyages, many of these early long-distance flights were exploratory in nature, intended to open up new air routes and test the viability of aircraft as a faster means of transporting mail, passengers and cargo to distant parts of the world, and of relocating aircraft for defence purposes. Could aircraft survive the rigours of major climatic changes? Were they reliable enough, and could they be repaired and refuelled in remote locations?

Reflecting these concerns and opportunities, the RAF began planning a cruise by a flight of four Southampton Mk II flying-boats to Singapore to foster defence co-operation between Britain and its Empire, and "to gain experience of the problems involved in the reinforcing of points on the Imperial routes with aircraft drawn from England





TAH ARCHIVE

ABOVE ***Officers of the FEF at Plymouth before their departure on October 17, 1927. From left to right: Gp Capt Henry Cave-Browne-Cave; Sqn Ldr Gerald Livock; Flt Lt P.E. Maitland and Flt Lt H.G. Sawyer. In July 1926 Livock had led a 7,000-mile (11,300km) flight of two Southampton Mk Is around the Mediterranean to Egypt and back.***

or other parts of the Empire", as British weekly magazine *Flight* reported. If the cruise proved successful, the aircraft would be stationed at a new base being constructed at Singapore.

SINGAPORE AND BEYOND

At the 1926 London Imperial Conference — a meeting of the heads of the nations of the British Empire — the Royal Australian Air Force (RAAF) Board asked the RAF to extend the cruise to include Australia. This request was accepted, and a circumnavigation of Australia was added to the planned route.

To show commitment to the RAF's plan, early in 1927 the RAAF ordered two ex-RAF Southampton Mk Is, serials S1158 and S1159, with the aim of co-operating with the RAF's examples during their visit to Australia, and in future operations to strengthen defence ties. The practical and commercial benefits of fostering the development of long-distance air travel were also abundantly evident to the prime ministers of Australia and New Zealand, who, despite the Prince of Wales's forecast five years earlier, both still faced 60 days of return sea travel to attend the Imperial Conference in London.

The RAF Far East Flight was to be led by Gp Capt Henry Meyrick Cave-Browne-Cave DSO DFC, with Sqn Ldr Gerald Edward Livock DFC as second in command. Both had experienced distinguished First World War flying careers, and Cave-Browne-Cave had held senior RAF command and engineering posts. His technical abilities were essential to the Flight's success and were much admired by his colleagues. However, as Livock later observed in his memoir *To The Ends of the Air* (HMSO, 1973):

"Ideally, [the leader of such an expedition] should be able to assume the roles of ambassador, diplomat, public-relations officer and film star. Unfortunately Cave [sic] was badly equipped for the social part of the operation . . . and was obviously ill at ease".

It seems that Cave-Browne-Cave did not enjoy the best of relationships with the press, "who are usually thirsting for sensation and not the slightest bit interested in popping engines or corroded rivets". This probably led to poorer press coverage of the FEF than might otherwise have been the case.

Livock's RAF career since the war had been an adventurous one, with travels to Russia, the Mediterranean and the Far East. In 1926 he gained much useful experience leading a successful pioneering flight of two Southamptons to Egypt and Cyprus. Later the same year he was sent to undertake a ground survey of the air route between Calcutta in India and Singapore, searching out landing and alighting places for both land- and seaplanes. Livock recalled:

"Practically nothing was known about the stretch from Calcutta to Singapore. Imperial Airways had not even extended [its] services as far as India. A landing ground of sorts was alleged to exist near Calcutta and a site was in course of preparation on Singapore Island. Apart from this, all the Air Ministry could tell me of

A FLYING HISTORY LTD

ABOVE ***The FEF's Southampton Mk IIs were specially modified for the long-range flight, incorporating increased-capacity tinned-steel fuel tanks (instead of light-alloy), larger oil tanks and an increase in radiator surface. Here S1150 is seen before departure wearing two stripes.*** **BELOW** ***Leading Aircraftman Williams brews up aboard S1149.***

the 2,000 miles [3,200km] between the two points was contained in a few rough notes".

The FEF was to be a major undertaking, by far the longest flight yet undertaken by a group of aircraft. By 1927 only four flights had been made from England to Australia, all by single machines. Planning the journey was a complex affair; routes had to be plotted, and moorings and refuelling organised well in advance along the entire route, several parts of which had not previously been flown. The easternmost RAF base was at Karachi in India, only about 5,000 miles (8,000km) along the 6,735-mile (10,840km) route to Singapore. Beyond India, ample spare parts and equipment were to be transported by sea to Singapore and Melbourne. A ground party of 26 RAF engineers would meet the Flight at Karachi, Singapore and Melbourne to conduct major maintenance and effect repairs.

TAH ARCHIVE

EARNING THEIR STRIPES

Each flying-boat would carry two officer pilots and two non-officer airmen, with the pilots being exposed to the elements in the Southampton's open cockpit. Cave-Browne-Cave would fly Southampton S1152 with Flt Lt H.G. Sawyer AFC; Livock would take S1149 with Flt Lt P.E. Maitland AFC; Fg Off G.E. Nicholetts was to accompany Flt Lt D.V. Carnegie AFC in S1150 and Flt Lt C.G. Wigglesworth AFC and Fg Off S.D. Scott were to take S1151. Livock wrote: "There can seldom have been a happier or more united team".

The FEF aircraft were given individual markings for recognition at distance: Livock's S1149 had a single black vertical stripe circling the forward part of the hull, duplicated on the hull aft of the wings; S1150 had two stripes; S1151 three stripes and Cave-Browne-Cave's lead aircraft had no stripes at all.

Based on Livock's experiences on the 1926 Egypt cruise, the aircraft had been adapted so that the crew could sleep and cook on board, and food for a week was carried in case of an emergency alighting. Livock reported:

"Although the Southampton was a pleasant aircraft to fly, it was not designed for comfort, and at the end of a long flight the crew would

AUTHOR'S COLLECTION

ABOVE ***A hand-coloured line-up of the officers of the FEF from a contemporary souvenir brochure. Front row, left to right: Flt Lt Wigglesworth; Sqn Ldr Livock; Cp Capt Cave-Browne-Cave; Flt Lt Maitland; Fg Off Nicholetts; Flt Lt Freeman. Back row, from l-r: Flt Lt Carnegie; Fg Off Cheesman; Flt Lt Sawyer; Fg Off Scott and Fg Off L. Horwood.***

arrive deaf and rather dishevelled. The cockpits were open and the pilot had little protection from sun or rain and none from the noise of the engines. There were no flying aids of any kind; no automatic pilot or blind-flying instruments".

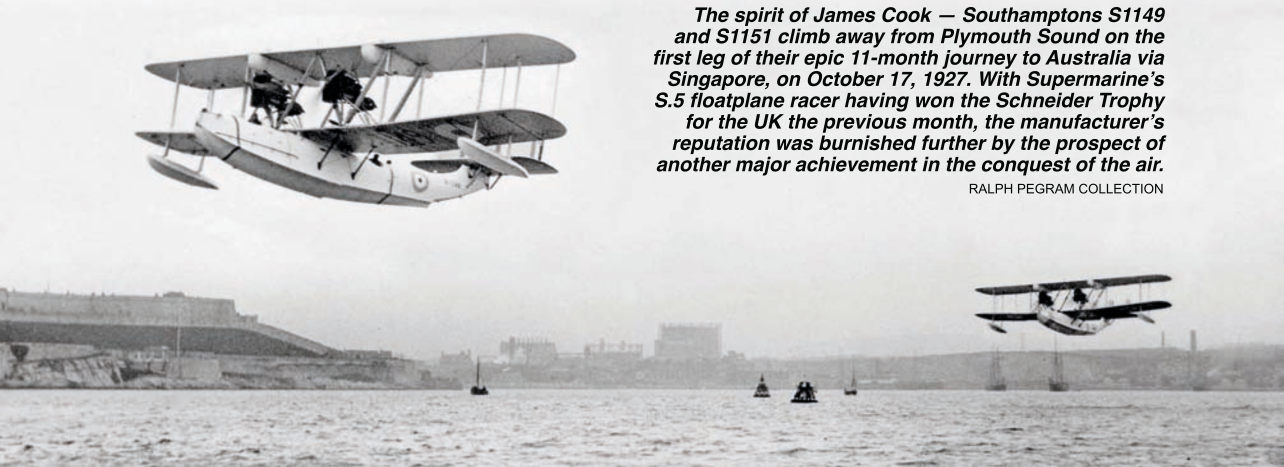
Two of the four aircraft carried wireless equipment to communicate with shore stations throughout the expedition. The Southampton's range was about 500 miles (800km) depending on conditions, so flights had to be carefully planned and refuelling from floating bases had to be organised, sometimes in remote locations. Fuel consumption was around 1 Imp gal (4·5lit) per mile per flying-boat, so considerable quantities were required at each refuelling point.

SETTING OFF

The Marine Aircraft Experimental Establishment (MAEE) at Felixstowe had been the FEF's home since its establishment in May 1927, and it was from here that the aircraft departed on October 14 that year for the rather unpleasant 276-mile (444km) flight in rain and thick mist to RAF Cattewater at Plymouth inDevon.

With all provisions in place, the FEF took off from Plymouth on October 17, 1927, with only one press photographer present to record its leaving. The Flight's port of departure and intended destination was the same as that of Lt James Cook's *HMS Endeavour* in 1768, although 159 years later their ships had wings and piston engines rather than sails. They still carried Cook's charts as navigation aids, but their voyage was to be an important step in the transition to international air travel.

The FEF's route to Australia was to pass through France, Italy, Greece, Egypt, Turkey, Iraq, Iran, India, Ceylon (now Sri Lanka), Burma (Myanmar) and Malaya (Malaysia), to arrive in Singapore five months later. *Flight* hailed the cruise as "the most ambitious flight of its kind ever to be attempted", while *The Aeroplane* saw it marking "the beginning of an Imperial defence policy which will undoubtedly be of vital importance in the future". The latter publication foresaw the early substitution of naval vessels by flying-boats, which would be faster and cheaper to operate in protecting "outlying possessions — including the vitally important landing stations of the submarine cables and the various wireless short-wave stations which . . . are extremely vulnerable to enemy air attack".



The spirit of James Cook — Southamptons S1149 and S1151 climb away from Plymouth Sound on the first leg of their epic 11-month journey to Australia via Singapore, on October 17, 1927. With Supermarine's S.5 floatplane racer having won the Schneider Trophy for the UK the previous month, the manufacturer's reputation was burnished further by the prospect of another major achievement in the conquest of the air.

RALPH PEGRAM COLLECTION

TAH ARCHIVE

ABOVE ***Three of the Flight's four Southamptons moored at one of the European stops, possibly Phaleron Bay in Athens, where, according to the Flight's Log, "the winds were light northerly", on which the flying-boats "rode quite safely and comfortably". The next stop was Aboukir in Egypt, where routine inspections were completed.***

On the first day the FEF took 5hr 5min to complete the 380-nautical mile (700km) trip to Hourtin, the French seaplane station on a lake north of Bordeaux, where refuelling was completed from 4 Imp gal tins rowed out in dinghies. The cruise continued 310 nautical miles (575km) to the air station at Berre, near Marseille, on October 19, where the flying-boats and crew were again cordially received by French officers, and the aircraft were efficiently refuelled. On October 21, the Flight continued to Naples, covering the 440 nautical miles (815km) in 7hr at an average speed of 66kt, alighting in formation alongside the island of Nisida in the Gulf of Naples.

While off Corsica during this leg, S1150 reported a serious engine-oil leak and alighted in a small bay, amply demonstrating the advantages of a flying-boat in an emergency. A crack in an oil-gauge pipe where it joined the engine was temporarily remedied and the aircraft rejoined the Flight after 20min. One of the strengths of the Southampton was its simplicity. There were few electrical and no hydraulic systems, and most repairs were easy to effect. The type's Napier Lion engines were already well proven under a variety of conditions, and, if one were to fail, the Southampton could still fly on a single engine.

At Naples the Flight used special moorings at the Italian seaplane station, where "every assistance" was given, according to the Flight's Log. On October 25 the Flight completed the 220-nautical mile (410km) flight to Brindisi on Italy's Adriatic coast. The Flight's Log records:

"Luckily the clouds were high, so the Flight [was] able to cross over the mountains on the 'heel and toe' of Italy at 5,000ft [1,500m] and proceed direct to Brindisi, thus avoiding the necessity of following the coast right round, an additional distance of about 220 miles [410km]."

At Brindisi the Flight was welcomed by officers at the seaplane base, and refuelling from 44 Imp gal (200lit) barrels proceeded smoothly. As at all locations where the FEF alighted, local dignitaries were shown the aircraft. It was found to be more comfortable and convenient for the crew to sleep aboard their aircraft.

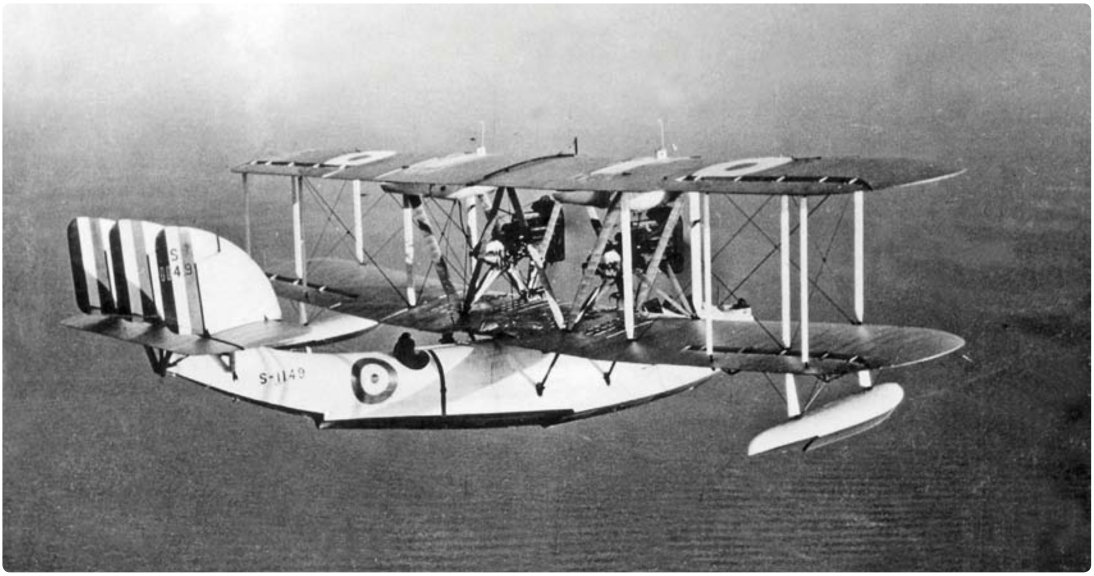
ACROSS THE MED TO AFRICA

On October 28 the 340-nautical mile (630km) flight to the air station at Athens, Greece, was completed and the flying-boats were secured to moorings in Phaleron Bay and refuelled, ready for the onward flight 500 nautical miles (900km) across the Mediterranean to Aboukir, Egypt, the following day. At the latter the Flight was met by RAF officers and accommodated at the RAF Depot, where its members were "most hospitably treated" during their five-night stay.

On November 3, flying around — and directly through — some heavy thunderstorms, the Flight re-crossed the Mediterranean 440 nautical miles (815km) to Alexandretta (now İskenderun) in southern Turkey. Refuelling from 4gal tins brought alongside by small lighters took about 2hr. The journey from Alexandretta to Baghdad in Iraq on November 5 was more demanding, as the Flight's Log records:

"Some difficulty was experienced in getting through the pass in the mountains behind Alexandretta, owing to the down-currents and low cloud. After crossing the mountains there was an easterly wind of about 25kt on the surface and even flying over the desert at 200ft [60m] it was only possible to average 45kt ground speed." It continues:

"At 0815hr the Euphrates was reached at Meskene and course set along it . . . the Flight was passing through heavy rain, which later



PHILIP JARRETT COLLECTION

ABOVE ***With its single stripe visible just forward of the rear hatch, S1149 pushes on under the power of its pair of 500 h.p. Napier Lion VA "broad arrow"-configuration 12-cylinder engines. The FEF Southamptons' fuel tanks were increased to 250 Imp gal each and the oil tanks to 18 Imp gal each, in order to provide the longest possible range.***

gave way to dust . . . visibility a few hundred yards. As a more-or-less direct course was steered, the Flight was sometimes over the river, but more often over the desert, and in many Arab camps the low-flying formation caused considerable movement amongst the cattle and people. It then became obvious that unless the weather improved, the Flight had insufficient fuel left to reach Baghdad. At 1230hr the ground speed dropped to 50kt and it was decided to land at Ramadi — 60 [nautical] miles [110km] from Hinaidi [Baghdad], and refuel [at] the emergency landing ground there."

The four large flying-boats alighted on the Euphrates at Ramadi after 8hr 30min of eventful flying, having averaged only 49kt over the course of the flight. Using their own collapsible dinghies, the crews took 30 Imp gal (136lit) of fuel out to each flying-boat. As on many nights previously, they slept aboard their aircraft.

On the morning of November 6 a short 60-nautical mile flight brought them to specially laid moorings on the Tigris and a welcome breakfast with the RAF at Hinaidi Depot in Baghdad. Here they spent four nights ashore, where the Flight's Log reports that "great hospitality was shown to the Flight, and everything possible was done to make the personnel comfortable".

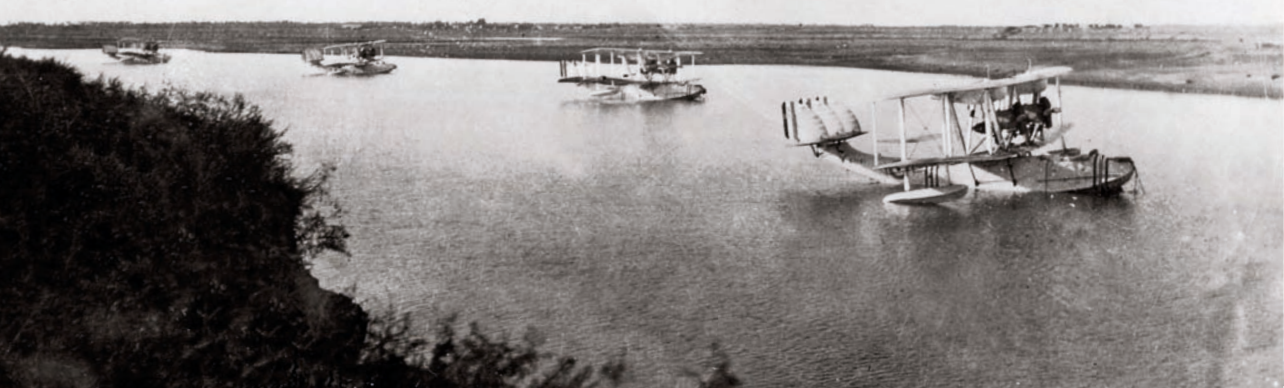
Before the Flight had left the UK, two of the Southamptons had been fitted with metal propellers and two with standard wooden propellers (S1149 and S1150). At Alexandretta on S1150, and now on S1149, the brass on the wooden props "had begun to bulge and draw the fastenings", necessitating replacements. Eventually the wooden propellers were replaced with Leitner-Watts metal examples, which remained trouble-free for the rest of the flight.

THE PERILS OF RIVER TRAFFIC

Alighting on the Shatt al-Arab at the RAF Depot at Basra, 260 nautical miles (480km) from Hinaidi, on November 10, the crews experienced

BELOW ***The four Southamptons moored on the Tigris at Hinaidi, where the FEF stayed during November 6–10. The Flight's Log records that on November 8, "King Ali [Faisal I] and his Prime Minister inspected the flying-boats, and the King was taken for a short flight over Baghdad in S1151," during which he "expressed great pleasure".***

PHILIP JARRETT COLLECTION



TAH ARCHIVE

ABOVE ***Southampton S1152 — with no stripes — undergoes engine maintenance, probably during one of the stops in the Middle East. This view shows the engines' increased-area radiator surfaces, nearly 50 per cent bigger than on standard UK-based Southamptons; this increased area kept the coolant to a maximum temperature of 76°C.***

a hazard that was to face them repeatedly during the cruise, as the Flight's Log relates:

"The great objection to this mooring site is the native boat traffic which passes constantly day and night, and, if there is no wind, [is] completely out of control. To guard against this serious risk, an officer of the Flight was detailed to patrol in a motorboat in the hours of darkness, and a guard boat was anchored at each end of the line of moorings with an officer and four airmen on board, with an Aldis lamp which lit up any passing craft." The Log continues:

"The searchlight from the gunboat *Grayfly* was also turned on to the flying-boats at intervals during the night. These precautions kept the Flight free of damage during their stay, but many native craft had to be towed clear and one lightly fouled a flying-boat without damaging it."

Again, the crews were able to sleep ashore, at the RAF Depot, and were well looked after during their stay.

On Saturday November 12 the Flight departed Basra to head down the largely inaccessible 1,200-nautical mile (2,200km) coast of the Persian Gulf, enjoying support and hospitality from Royal Navy ships and shore stations on the Iranian coast, including Bushire (where quarantine restrictions forced the crew to remain aboard their aircraft and bathe overboard) and "Henjam" (Hengam Island), alongside which the Flight alighted on November 14, staying for the 15th owing to a bout of sickness which had laid Fg Off Scott low.

The extent of the British presence along the Flight's route from Egypt to Singapore appears remarkable today. The Flight Log's report for November 14 states that "Henjam is a small, barren, rocky island which is used as a base by HM ships stationed in the Gulf. The Navy [has] made a golf course, cricket ground and tennis court. There is also a small club for officers and canteen for ratings. [There is] a telegraph and W/T station on the island, and go-downs for naval stores are situated close to the pier".

On November 16 the Flight pushed on to Gwadar (now in Pakistan, but ruled by the Sultan of Oman in 1927), where they offered Capt Smith, the British Political Officer to Makran, a lift to Karachi aboard one of the flying-boats. Livock describes the day's flight:

"Even in the cool season the Persian Gulf is hardly a place of conventional beauty, but as we flew low for hour after hour along the desert coast we could not help being impressed by the moon-like interior, which looked as if it had been made out of gigantic splintered firebricks."

HALFWAY TO SINGAPORE

Exactly a month after leaving Plymouth, the FEF took off from Gwadar on Friday November 18 for Karachi, India, with Capt Smith flying aboard S1150. Approaching the city, they were met by an escort of de Havilland D.H.9As and Bristol Fighters from the RAF Depot before alighting in the harbour.

At Karachi, a little more than halfway through their journey to Singapore, they would stay for nearly a month so that the base engineering party could undertake a thorough inspection of the aircraft, which were hauled up one by one on to the beach. Fouling of the hulls by barnacles and "tufts of wood" after a fortnight in the harbour meant that a day per aircraft had to be spent cleaning and painting their undersides.

Undergoing a thorough overhaul, cleaning and repainting, S1152 is seen here on the beach at Karachi on December 10, 1927. Four days later, the Southamptons were inspected by the Air Officer Commanding, India — Air Vice-Marshal Sir Geoffrey Salmond — who joined Cave-Browne-Cave and Sawyer aboard S1152 for the 475-mile flight south to Bombay on December 15.

PHILIP JARRETT COLLECTION

With crews and aircraft refreshed from their long stay in Karachi, the Flight set out on December 15, 1927, for the 475-nautical mile (880km) leg to Bombay. This was the beginning of a 2,700-nautical mile (5,000km) journey down the west coast of India to Ceylon before turning north again to traverse the east coast of India up to Calcutta (now Kolkata). Livock recalled:

"In some ways the flight down the west coast of India to Ceylon was the most interesting, and certainly the most entertaining, of the whole cruise. As far as I know, no aircraft had ever flown that way before and, as news of our programme had been sent ahead, the inhabitants of whole districts flocked down to the beaches to watch us pass. It was an extraordinary sight to see miles of beautiful sandy beach crowded with thousands of Indians, all looking up as we flew over their heads."

The Flight, secured to buoys off the Yacht Club, spent Christmas in Bombay, where it stayed until December 27. This may appear a long stay so soon after the FEF's month-long sojourn in Karachi, but the Flight was operating to a leisurely timetable. Slack had been built in to the schedule so that, in the event of any technical problems with the aircraft, there would be minimum disruption to refuelling arrangements, which had to be planned months in advance.

Reaching Mangalore, 295 nautical miles (547km) south of Bombay, on December 27, the Southamptons were the first aircraft the locals had ever seen and large numbers of visitors had come to view them. The Flight's Log records:

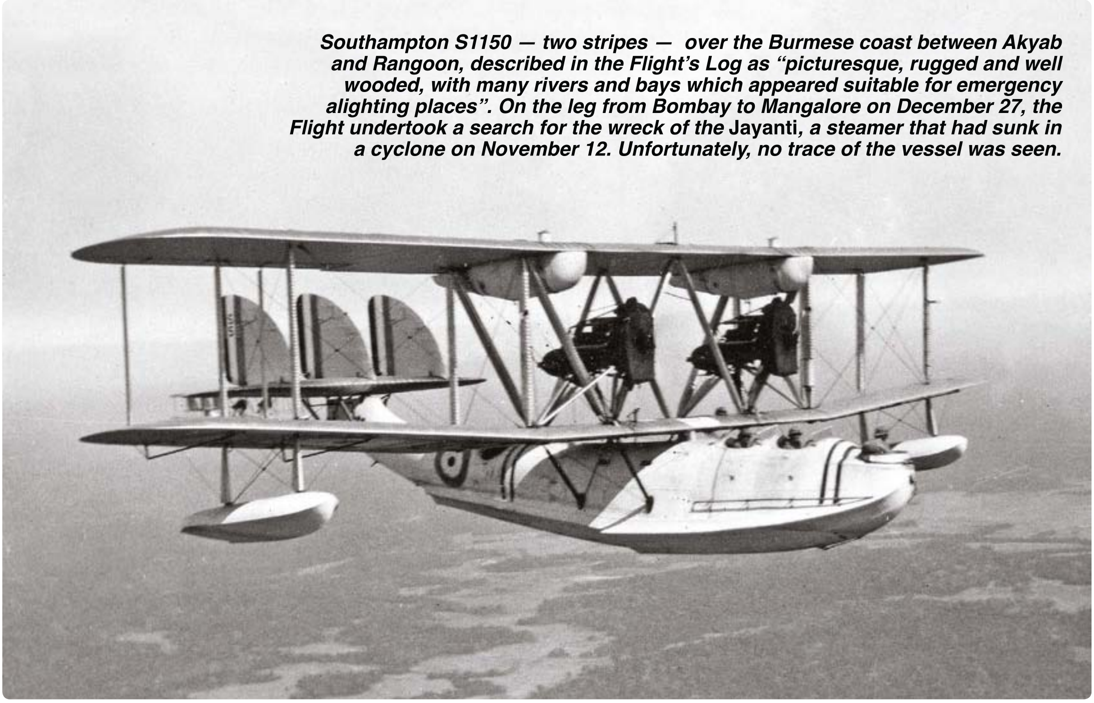
"The whole shore and the quay were packed with natives, who remained watching the flying-boats until long after dark, and were there again by daylight the following morning."

On December 29, when the Flight departed Mangalore, large crowds "shouted and cheered as each 'boat took off", according to the Log. The reception 195 nautical miles (360km) further south at Cochin on December 30 was similarly enthusiastic, and on the 315-nautical mile (580km) trip south to Colombo in Ceylon the following day, "the Flight appeared to arouse great interest, the beaches and open spaces near the towns and villages being crowded".

CEYLON . . . AND ON

After ten days in Colombo, which the eight airmen of the flying crews spent at the Naval Rest Camp at Diyatawala in the central highlands, the Flight moved on 290 nautical miles (535km) to Trincomalee on the north-east coast of the island on January 12, 1928; S1149 and S1150 flying round the south of the island and the other two aircraft around the north. It was to be one of the most eventful flying days of the whole cruise.

Colombo harbour had a reputation for barnacles and weed fouling the undersides of ships, and the flying-boats were not immune. As a result, the take-off was very slow for all aircraft because of the extra drag on the hulls. Then S1150 had a seagull fly into the starboard propeller, the dead bird remaining jammed at the base of the V-strut under the engines for the rest of the flight. Fortunately, the metal propeller was undamaged. Livock, in S1149, recalled:



Southampton S1150 — two stripes — over the Burmese coast between Akyab and Rangoon, described in the Flight's Log as "picturesque, rugged and well wooded, with many rivers and bays which appeared suitable for emergency alighting places". On the leg from Bombay to Mangalore on December 27, the Flight undertook a search for the wreck of the Jayanti, *a steamer that had sunk in a cyclone on November 12. Unfortunately, no trace of the vessel was seen.*

PHILIP JARRETT COLLECTION

"I innocently decided to fly through the middle of a tropical storm instead of going round it. It was the first really bad storm I had encountered and I soon regretted my stupidity, for the rain literally roared down, while the turbulence inside the squall threw the aircraft about in a most terrifying manner.

"The water, about 100ft [30m] below us, was only just visible. When, after five or ten minutes, we passed through the storm and emerged into bright sunshine, I was dripping with rain and perspiration and was extremely shaken."

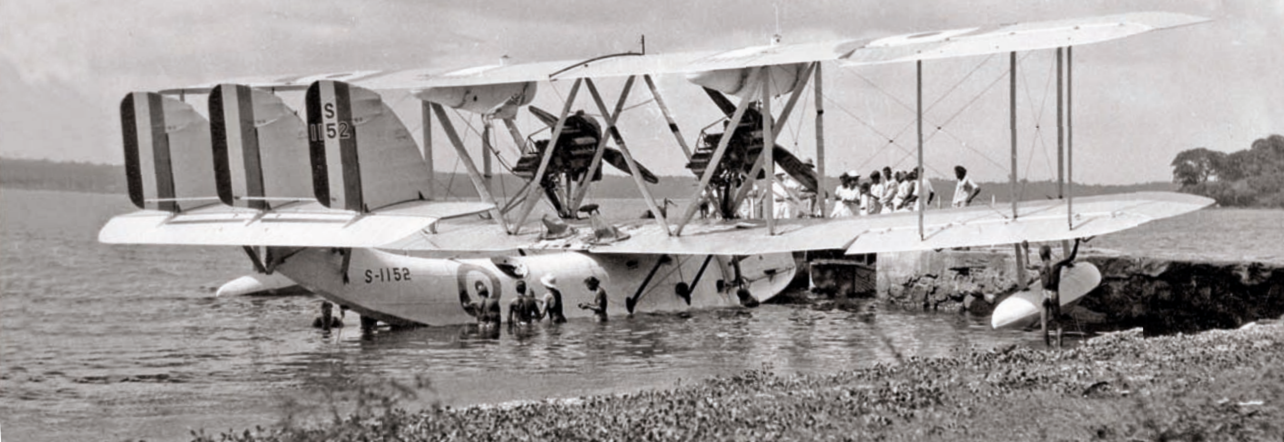
It was a lucky escape. According to the Log, "the engines dropped revolutions and ran unevenly, and the pilot had the greatest difficulty to avoid being forced on to the water, which was too rough for a safe [alighting] and take-off".

On January 13, at Trincomalee, near the shore and with the aircraft just afloat, "the officers and airmen of the Flight, assisted by three seamen and six coolies, removed the weed and barnacles from the bottoms with hand-scrubbing brushes and pieces of wood" relates the Flight's Log. "The barnacles were firmly fixed to the paint," it continues, "which generally came away with them, and as most of the cleaning had to be done with the head under water, it was most exhausting. The flight tests showed that the average time for take-off with the clean bottoms was 30sec, compared with the 50sec required with the dirty bottoms".

After nearly a week at Trincomalee, the Flight completed the 325-nautical mile (600km) leg northwards to Pulicat Lake, north of Madras (now Chennai), on January 19. During the flight S1152 experienced a water leak in the starboard

BELOW ***Blistering barnacles — literally. After arrival at Trincomalee, Ceylon, on January 12, the Southamptons were taxied in turn the following day to shallow water in front of the naval sick quarters and secured to a small pier there, at which point the crew and some locals set about removing the troublesome barnacles and weeds.***

RALPH PEGRAM COLLECTION



engine, the result of a failure of a small washer on the rear water connection to the starboard cylinder head. The engine was shut down and the aircraft dropped 400ft (120m) while completing the remaining 20min of the flight on the port engine. The washer was replaced on arrival at Pulicat and an inspection revealed no damage to the affected engine.

The following day the Flight moved on 300 nautical miles (550km) further north to Cocanada (now Kakinada) for three nights, before continuing to Chilika Lake (spelled "Chilka" in the Flight's Log), on the coast south of Cuttack, on January 23. Here, after circling above a large crowd that had collected near the Rambha Palace and on the southern shores of the lake, the Flight alighted in formation to be greeted by the Rajah of Khallikote and Atagada, who accommodated the crew at his palace and, according to the Flight's Log, "entertained the Flight most generously during their stay", which lasted four nights.

Flying machines had not been seen before in this area and created keen interest. The Rajah had organised a large house party and invited two other Rajahs and some British District Officers. There were "large luncheon and dinner parties, and after the latter, the villagers of the surrounding villages gave very interesting displays of sword-dancing and their ancient methods of warfare", according to the Flight's Log. The Rajahs were treated to local flights while "the local native boatmen made large profits by taking parties from the shores of the lake round the flying-boats".

Livock recounts how the Rajah "brought the Rani out of purdah one afternoon to show her over my boat. It was a rather complicated process getting her on board, as all the locals had to be driven back from the road which led down to the jetty. The Rani slipped out of a heavily-curtained Rolls-Royce into a barge, which was poled out to the flying-boat. She then emerged, heavily veiled, from the closed cabin and climbed into our rubber dinghy, which I rowed the last few yards to the aircraft.

"Once on board the Rani threw back her veil and asked for a cigarette! After looking round and asking many questions, this beautiful and intelligent lady replaced her veils, and the complicated manœuvre of returning her to the seclusion of the palace was completed."

On the misty morning of Friday January 27 the Flight took off for the final 290-nautical mile (535km) leg to Calcutta, where the four Southamptons alighted on the mighty Hooghly River at Ichapur, 15 nautical miles (28km) north of the city. Here the Governor and many other visitors came out to visit the flying-boats during their week-long stay.

TO BURMA

On February 3 the Flight departed Calcutta and headed east across the Ganges delta, then south along the jungle-covered Burma coast on the final 1,800 nautical miles (3,300km) of their

MAP BY MAGGIE NELSON

journey to Singapore. They reached Rangoon (now Yangon) on February 6, after a two-night stop at Akyab (now Sittwe) in northern Burma. Here, the hottest conditions on the expedition so far were experienced, with a maximum hull temperature of 32°C (90°F). Again the Flight aroused great interest and large numbers of visitors were shown over the flying-boats.

After departing Rangoon for Mergui in southern Burma on February 13, S1151 reported taking on water during take-off, the Log stating that "this was found to be due to the lid of the lavatory not having been sufficiently tightened; this was rectified and the water cleared out in flight". Conditions at Mergui were even hotter, with temperatures soaring to 35°C (95°F), and the crews were greatly troubled by mosquitoes as they slept on board.

The Southamptons were each fuelled with 450 Imp gal (2,045lit) for the long 475-nautical mile (880km) 6½hr flight to Penang on the Malay Peninsula, then part of the British Crown colony known as the Straits Settlements. When taking off from Mergui on February 16 it was noticed that the connecting strut between the centre and starboard rudders on S1150 was disconnected. All four flying-boats alighted and returned to their moorings. An eyebolt on the centre rudder had broken, was temporarily repaired and, less than 2hr after alighting, the Flight took off again.

During the week-long stay in Penang there were the usual large crowds and many visitors to the flying-boats. Sampans were used to bring barrels from the lighter to the aircraft for refuelling. On February 23 the flying-boats made the short 160-nautical mile (300km) flight south to Port Swettenham (now Port Klang in Malaysia). Here the Governor of the Straits Settlements, Sir Hugh Clifford, requested that the Flight's departure for Singapore be delayed for a day to enable him and his staff to fly down in the Southamptons, and the Air Ministry and Singapore were advised of this change.

After four days at Port Swettenham the Flight, with the passengers divided between the four flying-boats, departed on February 28 for a bumpy ride with thunder and several heavy rainstorms, ultimately alighting off the site of the new RAF base at Seletar on Singapore island. A large party, including the Governor's wife, Colonial Secretary and senior military personnel, greeted the Flight, after which all the crews were accommodated in Singapore town.

FIRST HALF COMPLETE

The Flight had covered a total distance of 9,434 nautical miles (17,483km) since leaving the UK. Group Captain Cave-Browne-Cave reported to the Air Ministry that the aircraft and engines had been "very satisfactory", suffering only minor technical issues which had been speedily resolved. Hull-fouling had proved a problem, however, as "it has seldom been possible to clean the bottoms of the hulls in deep water owing to the presence of sharks".

The FEF then spent almost three months in

RALPH PEGRAM COLLECTION

ABOVE ***After a bumpy flight from Port Swettenham through thunderstorms over the Johore Straits, the Flight arrived at Singapore in light rain at 1705hr local time on February 28, 1928, before being brought ashore over the next few days. Here a landing party prepares to haul S1150 on to dry land at Singapore for overhaul and repainting.***

Singapore before setting off on the second half of the expedition to Australia. As they had been at Karachi, the aircraft were brought ashore, thoroughly examined by the base party, then cleaned and repainted. According to the Flight's Log, "this examination has shown the aircraft to be in very good condition, and at no time have the metal hulls leaked. No wires have broken and the aircraft structures have required practically no adjustment". Weather conditions had, on the whole, been good, except for very heavy rain in Ceylon. *Flight* reported in its March 1, 1928 issue:

"While Bert Hinkler has made glorious history in British aviation on the civilian side, the Service has not been idle, for it has also added another triumph by the arrival at Singapore of the four RAF Supermarine-Napier flying-boats, thus completing the main portion of the Great Flying Boat Cruise to Australia. The Flight has accomplished the longest formation flight by flying-boats in the history of aeronautics — without a single serious mishap — more than 10,000 [statute] miles [16,000km]."

NEXT TIME *The author concludes the story of the Far East Flight with the Southamptons' circumnavigation of Australia and subsequent "mini-tour" of South-east Asia*

BELOW ***The Southamptons of the Far East Flight remained at Singapore, where they underwent another major inspection and overhaul, until late April 1928, when they were rolled out ready for the next stage of their epic aeronautical adventure, which would see them continue on through the Dutch East Indies to circumnavigate Australia.***

A FLYING HISTORY LTD

Warpaint series No.116 Orders from the world's book and hobby trade are invited £16.00

Hawker FURY and NIMROD

The first RAF front line fighter to achieve more than 200 mph was the Hawker Fury, and its naval counterpart the Hawker Nimrod. These two attractive fighters came from the design office of the late Sydney Camm, Hawker's chief designer. The Fury started life as a private venture known as the Hornet but when this machine exceeded expectations the name was changed to Fury. Although only ordered in small numbers owing to financial constraints during the Great Depression production eventually exceeded 260 machines with orders from the RAF, Royal Navy, Persia (now Iran), Portugal, Spain, Yugoslavia and more than 30 supplied (ex-RAF) to the South African Air Force. The Fury entered service with No.43 Squadron who accepted 16 during May 1930 and stayed in front line service until January 1939 when it was replaced by the Gloster Gladiator, although quite a few remained in the training role until mid-1941. The Furies were used in combat during WWII by Yugoslavia where they were quickly despatched by the more modern fighters of the Luftwaffe. South Africa used Furies in the East African war until 1941 and the three supplied to Spain were in action, one of them serving on both sides! The Nimrod, while bearing a distinct resemblance to the Fury, flew early in 1930. Changes for the RN included longer exhaust pipes extending down both sides of the fuselage as far as the pilot's cockpit; an oil cooler fitted beneath the engine bay and at a later date arrester gear was fitted for carrier use. Later series Nimrods featured a larger tail surface to improve inverted spinning characteristics when fitted with floats. Deliveries of Nimrods started in September 1933 and they remained in use until May 1939. Only a small number of Nimrods found their way abroad, two went to Denmark to act as pattern aircraft for licensed production, one was shipped to Japan and one to Portugal. Although one Fury managed to survive in the scrapyard of a London dealer it fell to John Isaacs, a draughtsman from Vickers Armstrong, to design and build both a 1/7th scale Fury and Spitfire, both of which continue to be built by members of the Light Aircraft Association, née the Popular Flying Association. This book is written by William Harrison and is superbly illustrated by Richard J.Caruana.

Warpaint on the web
For more information on previous issues and secure ordering please visit:
www.guidelinepublications.co.uk

All major credit cards accepted. Orders can be placed by mail, telephone, fax or through the website. (www.guidelinepublications.co.uk) Plus postage and packing on all orders. Overseas readers pay postage at air mail printed paper rate.

Previous title:
Armstrong Whitworth Albemarle
£13.00

GUIDELINE PUBLICATIONS

Unit 3, Enigma Building, Bilton Road, Denbigh East, Bletchley Bucks MK1 1HW
Telephone: +44 (0)1908 270400, Fax: +44 (0)1908 270614, Email: kim@regallitho.co.uk

EAST ANGLIA BOOKS

Aviation and Military Books for the Historian – Collector – Enthusiast

Trading for over 37 years!

Extensive range of USAAF WWII Histories plus RAF and other Air Force unit histories, personal stories, operations, airfields, details of individual aircraft types, wrecks and relics, military history and vehicles, nose art and aviation art, clothing, medals and insignia, modelling . . . and much more!

MEMORIES OF THE 384th BOMBARDMENT GROUP (H): Stories of the Men, the Missions and the Machines *by Ken Decker.* Large format, spiral bound softback, back in print, c600pp, illustrated. **£59.95**

THE BOULTON PAUL DEFIANT: A Technical Guide *by Richard A. Franks.* (Airframe Detail No 5). Includes historical photos and detailed images, colour profiles. Ideal for modellers! **£13.95**

BRISTOL BLENHEIM Mk I & Mk If — Modeller's Photographic Archive No 1 by *M. Postlethwaite & A. Price.* A4 landscape softback, 96pp, colour wartime photos some 60cm across, plus much more! **£20.00**

CONSOLIDATED B-24 LIBERATOR Vol 1 *by David Doyle* (Legends of Warfare). Chronicles the design, development and wartime use of this iconic heavy bomber. Hdbk, clr & b/w photos. October! **£17.50**

THE POLISH FEW: Polish Airmen in the Battle of Britain *by Peter Sikora.* Hardback with d/jacket, 264pp, 100 illustrations, 156 x 234mm. Due October! **£25.00**

THE DOOLITTLE RAIDERS: What Heroes Do After a War *by George Nolta.* Collection of biographical sketches of the eighty brave men and their lives before and after the raid. Softback, 144pp, 16 images. October! **£14.99**

WRECK RECOVERY IN BRITAIN THEN AND NOW *by Peter J. Moran* (After The Battle). The exploration of wartime crash sites in Britain, includes every MoD licence application. November! **£tba**

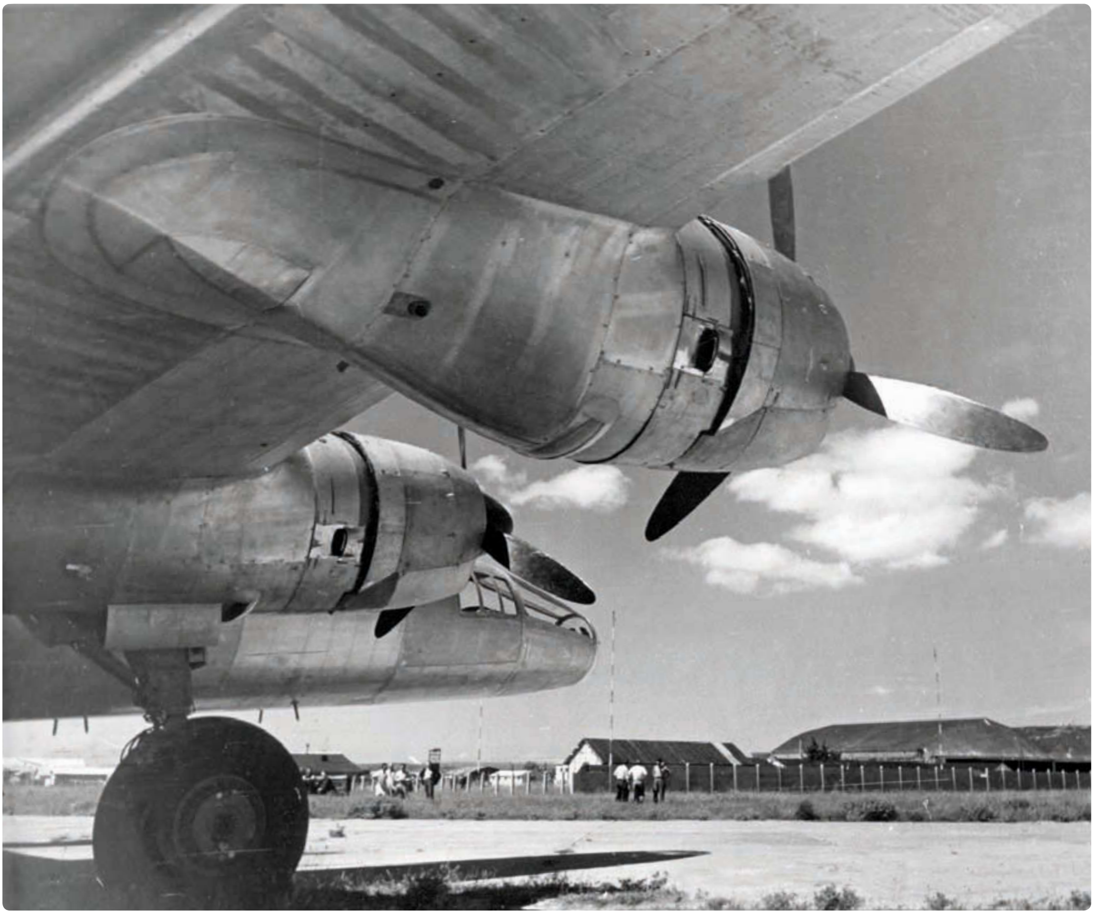
Contact us for a FREE copy of our 2018 catalogue!

(Prices are plus postage & packing. All our books are packed carefully by hand.)

PO Box 12408, Stansted, Essex, CM24 8UZ, ENGLAND Telephone +44 (0) 1279 813791
E-mail sales@eastangliabooks.com Website www.eastangliabooks.com
Facebook www.facebook.com/eastangliabooks

TRAGIQUE The Sud-Est SE.1010

In 1945 France's *Institut Geographique National* was tasked with surveying the nation's vast territories, not only at home but also in Africa, Asia and the Pacific, for which a long-range "stratospheric" photo-reconnaissance platform would be required. **JOËL MESNARD** traces the tragic history of the sole SE.1010, presented here for the first time in English



FRANCE'S *INSTITUT Géographique National* (National Geographical Institution — IGN) was established in 1940 as the successor to the *Service Géographique de l'Armée* (Army Geographical Service). The IGN's activities were curtailed, however, when France was occupied by German forces that June, only to be resumed after VE-Day in 1945. It was then assigned the task of mapping all territories under French administration, including not only continental France, but also its vast colonies in North, East and Central Africa, Madagascar, Indochina and remote islands in the Atlantic and Pacific Oceans.

More than 12,000,000km² (3·7m square miles) had to be photographed, vertically and in clear weather, from aircraft flying as high as possible. Part of the task could be accomplished using twin-engined machines such as the Lioré et Olivier LeO 453 and 455Ph, but larger aircraft would be necessary to cover such a vast area. Accordingly, the IGN acquired four surplus Boeing B-17Gs, which were delivered to Creil, 50km (30 miles) north of Paris, in late December 1947 and early January 1948. These were registered F-BEEA to F-BEED, and were considered only an interim solution, as the operating ceiling of the B-17s was limited — as was accommodation for the crew and sufficient space for the bulky and heavy photographic equipment.

At the same time at Marignane, 25km (15 miles) north-west of Marseille, a completely new four-engined aircraft was taking shape at the *Société Nationale de Constructions Aéronautiques du Sud-Est* (SNCASE) factory. As early as 1943, the SNCASE design bureau (headed since August 1, 1942, by Louis Marnay) had undertaken preliminary studies into a pressurised four-engined "stratospheric" transport aircraft, designated the SE.1000, intended for operations across the North Atlantic.

Windtunnel tests were performed at Banlève, near Toulouse, but the project had become unrealistic by the war's end, as the number of passengers that the SE.1000 could accommodate for transatlantic operations was only four to eight, depending on the level of comfort required. It was also extremely uneconomical and potentially dangerous (although the latter did not become clear until later), as the aircraft's chosen powerplant (an early version of SNECMA's 14R radial engine) was to prove unreliable and unable to deliver its predicted 1,590 h.p. take-off power.

Work on the SE.1000 and SE.1001 (as it was designated after modification to the design) did not progress beyond building a test model of the pressurised cabin. Engineers at the Marignane design bureau gradually shifted their efforts to a stratospheric photo-reconnaissance version aimed at fullfilling the needs of the military and/or the IGN. This became the SE.1010, which featured a distinctive long glazed nose. In September 1945 the *Ministère de l'Air* requested that the design bureau in Marignane study a strategic-reconnaissance aircraft for the *Armée de l'Air* (French Air Force).

Work started on the first SE.1010 prototype (No 01) in 1946, and windtunnel tests were undertaken at Banlève between December 1946 and March 1947. The Armée de l'Air quickly lost interest in the project, however: officially because of the new design's poor cruising speed, but in reality because post-war budgets were severely restricted and the air arm had higher priorities.

The IGN remained interested, nevertheless. A somewhat optimistic plan issued as early as June 1945 called for the delivery of one example in 1946, three in 1947 and four more in 1948. Yet by June 1945 the building of the prototype was progressing slowly, and it was not ready to undertake preliminary engine ground-runs before the end of January 1948. Meanwhile, work had begun on two production examples.

SLOW PROGRESS

The SE.1010's fuselage was of circular section from nose to tail, and optimised for photographic work at altitudes of up to around 10,000m (30,000ft) when at 24,000kg (52,910lb) gross weight. The maximum loaded weight of 33,000kg (72,750lb) allowed operations up to about 8,000m (24,000ft). The pilot's seat was offset to port and surrounded by large glass panels. Ahead of the pilot, behind a near-hemispheric transparent cupola, the navigator enjoyed a wide field of view.

Engines Nos 1 and 2 (on the port wing) were of the 14R-29 type, the propellers rotating anti-clockwise when seen from the front. Those on the starboard wing were 14R-28s, the props rotating in the opposite direction. The unusual planform of the wing was characterised by a trailing edge markedly swept forward. The ailerons were of the Mercier type, similar to those fitted to the twin-engined SE.100 ground-attack fighter of 1940 (see *Rum Punch* in *TAH13*). Thanks to landing flaps occupying the entire length of the trailing edge, the aircraft's landing speed was 135km/h (84 m.p.h.). The tailwheel could be extended to decrease and increase angle-of-attack for take-off and landing respectively.

At the end of January 1948, although far from

OPPOSITE PAGE, TOP ***The sole SE.1010, F-WEEE, displays its sleek lines during its extensive trials programme in 1948–49.*** **OPPOSITE PAGE, BOTTOM** ***The SE.1010 at the SNCASE airfield at Marignane, near Marseille. Like many post-war French aircraft, the SE.1010 gave the lie to the old adage "if it looks right, it flies right".*** TAH ARCHIVE x 2

AUTHOR'S COLLECTION

ABOVE ***The prototype SE.1010 under construction in the Marignane hangar on January 20, 1948. In the foreground is the fuselage of one of the two production examples, neither of which was ever completed; in the background is the fourth SE.200 Amphitrite six-engined flying-boat, which was also never completed and was ultimately scrapped.***

ready to fly, the prototype was rolled out for preliminary engine tests. It was then pushed back into the hangar at Marignane for further adjustments. Again work progressed slowly; so much so that it did not make its first hops from the Marignane airfield until June 29 that year. The registration letters F-WEEE were painted on the fuselage and wings, in sequence with the markings of the IGN's first four B-17Gs. As a result of these first short straight-line hops, an exploration into the airflow around the fuselage and engine nacelles was made with the application of stripes of coloured oil, giving the prototype the appearance of a zebra. The fin and rudder surfaces proved to be insufficient, and Marnay's engineers redesigned the fin to make it taller. Work continued on the prototype, both inside and outside the large hangar at Marignane, for the next six months. By mid-November 1948, the aircraft was at last ready to fly.

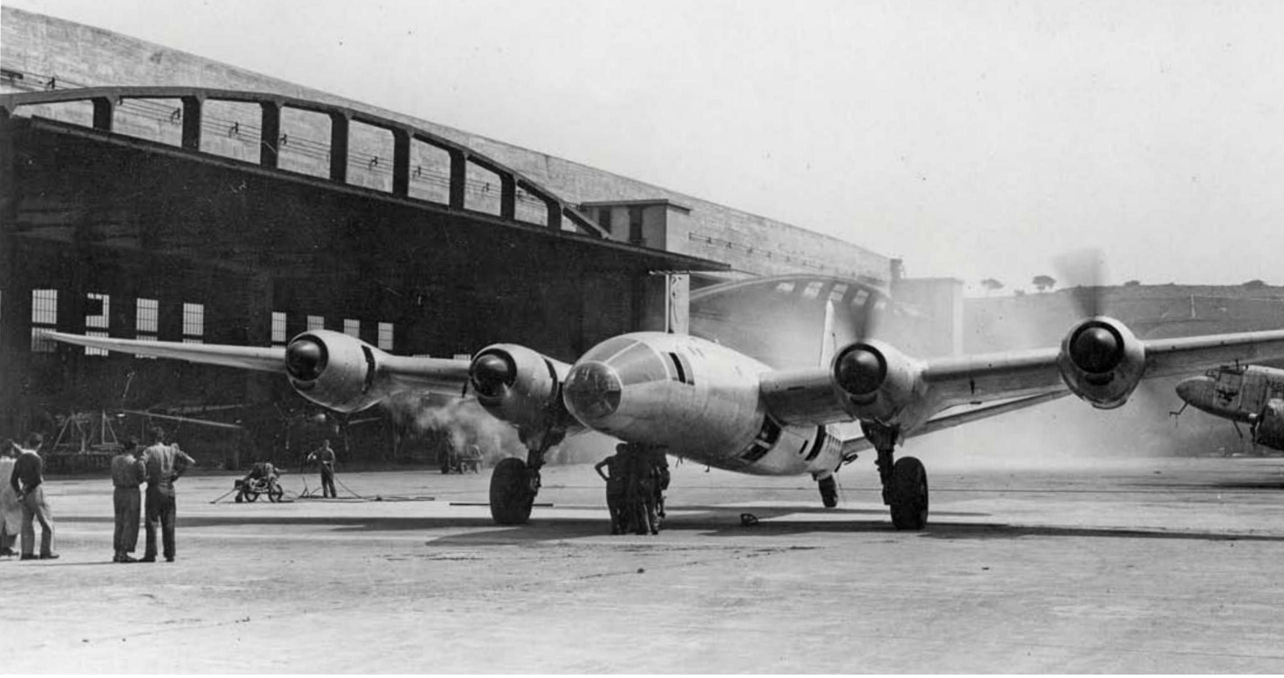
The SE.1010 took off on its maiden flight at 1603hr on November 24, 1948, weighing in at 20,815kg (46,200lb) and carrying a crew of four. The pilot, Jacques Lecarme, was assisted by Henri Vanderpol. Also present were Louis Marnay and mechanic Michel Leroy. Lecarme, an engineer before he was a test pilot, had contributed to several design studies by Lioré et Olivier during the 1930s, notably the twin-engined LeO 45 bomber, the aforementioned SE.100 and the six-engined transatlantic SE.200 flying-boat.

IRONING OUT PROBLEMS

During the SE.1010's first flight Lecarme noticed that raising the flaps created an undesirable nose-down pitching. He also found that the aircraft had a tendency to bank and turn to port, requiring unacceptable effort on the rudder pedals. The Mercier ailerons proved efficient though heavy. Raising the mainwheels generated unpleasant vibrations, owing to poor fitting of the undercarriage doors. For these reasons, the

BELOW ***The prototype undergoes undercarriage-retraction tests on the ramp at Marignane. Although a large aircraft, with a span equal to that of an Avro Lancaster, the SE.1010 was designed to be operable from relatively small semi-prepared airfields, and would have carried a spare mainwheel and tailwheel as standard equipment.***

AUTHOR'S COLLECTION



TAH ARCHIVE

ABOVE ***Engineers look on as the prototype's 14R engines are run outside the distinctive hangar at Marignane in early 1948. The 14R radial was originally a product of the Gnome-Rhône company, which was nationalised in August 1945 to become the*** **Société Nationale d'Etudes et de Construction de Moteurs d'Aviation** ***(SNECMA).***

first flight lasted only 20min, and the prototype was wheeled back into the hangar for mechanical adjustments that were to take three weeks.

The aircraft's second flight was made on December 14, 1948, for which the take-off weight had been increased to 21,840kg (48,530lb). A fifth crew member, engineer Pierre Bouillon, joined the flight team. The initial control problems had been solved, allowing the prototype to remain airborne for 2hr 20min, during which the autopilot was successfully tested.

Two days later a sixth crew member, engineer Dumax, joined the crew for the third flight, and photographs of the attractive prototype were taken from a Nord NC.701. During an attempt to open the SE.1010's large port-side door on this flight, the slipstream sucked it out of its rails and it was damaged, forcing the aircraft to make an emergency landing at Istres, on the opposite side of Lac de Berre. The door was repaired in less than 4hr, however, and the flight-test programme was immediately resumed.

The SE.1010's sixth flight, on December 22, showed that reducing power on one or two of the starboard engines caused a disturbance of the airflow over the upper surface of the flaps and around the fin and rudder. Lecarme was particularly unhappy about this, especially as the 14R engines were far from trouble-free. As a result, an enlarged dorsal fin was designed and installed during the first three weeks of 1949, and the engines were changed.

The seventh flight, on January 26, 1949, proved that the enlarged dorsal fin did not significantly improve the airflow around the fin and rudder. Reducing power on one side generated rudder vibrations, which then transmitted to the whole airframe. No Kármán-style fairing could be fitted between the fuselage and the wing's trailing edge, which was very close to the door on the port side.

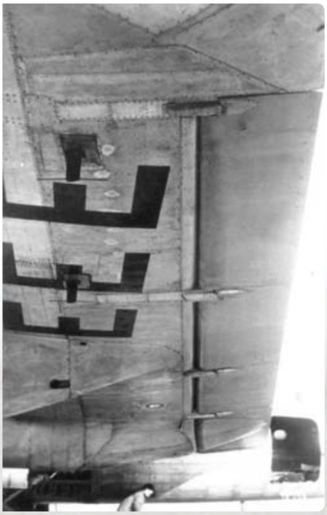
Flight tests continued, and, during the tenth on February 3, the SE.1010 flew in formation with SE.161 Languedoc No 58 (31.S-8) of Orly-based Escadrille 31.S of the *Aéronautique Navale* (French Fleet Air Arm). On February 15 the SE.1010 landed at Toulouse-Blagnac, where SNCASE was developing other new prototypes, including the transatlantic SE.2010 Armagnac, as well as manufacturing 100 Languedocs. The SE.1010 flew back to Marignane the next day, still suffering from longitudinal stability problems.

The aircraft's 15th flight was made on March 7, and again it was returned to spend some time in the large assembly hall at Marignane. The shape of the rudder's upper extremity was modified, with a rounded leading-edge on top. Other changes were less visible, such as new engine cowlings and slightly less-pointed propeller spinners. Spoilers were added to the wing in an effort to improve lateral control at low speeds. These were tested during the 17th flight, undertaken on April 21. The results were satisfactory, but Lecarme was still not entirely happy with the flight controls and overall lack of symmetry and harmonisation, and the flaps on the port wing were lowered by one third of a degree.

FROM LEFT TO RIGHT

Engine No 3 was found to be faulty and changed, but on a flight on April 27, 1949, the replacement engine also began misbehaving. The SE.1010 returned to land under emergency conditions,

AUTHOR'S COLLECTION x 4



ABOVE ***Yet to have its registration applied to fuselage and wings, the SE.1010 undergoes maintenance alongside Nord NC.702 F-BBFR at Marignane some time before its first short hops in June 1948.***

FAR LEFT, TOP ***The SE.1010's unusual Mercier ailerons were fitted to the tips of the wings, allowing the flaps to run the entire length of the trailing edge.***

FAR LEFT, BOTTOM ***The tailwheel doors were articulated, with a fold in the door when in the wheel-down position, to allow full travel of the elevators on the low-set tailplane.***

LEFT ***In order to provide as good a performance as possible from short semi-prepared airfields, the SE.1010 incorporated flaps along the trailing edge of the 16 per cent thickness-to-chord-ratio wings.***

BELOW ***Still fitted with its original shorter fin and with registration F-WEEE applied, the SE.1010 makes its first short hops at Marignane on June 29, 1948, in the hands of test pilot Jacques Lecarme. At the time, Lecarme had only recently converted on the de Havilland Vampire, which was to be manufactured under licence by SNCASE.***

TAH ARCHIVE

Bearing the number "25" on its forward fuselage, F-WEEE is inspected by members of the public at the 18th Salon de l'Aéronautique at Paris in May 1949. According to British weekly **Flight***, the type "contrasted with the more corpulent transports" present; the magazine also noted its Mercier ailerons, "the effectiveness of which was convincingly demonstrated by large roll-angles without visible trace of slewing or directional deviation".***

AUTHOR'S COLLECTION

and No 3 engine had to be changed again. While the aircraft was back in the assembly hall, the port-side flaps were set further down, to two thirds of a degree. This was evidently too much, as on the next flight, on May 4, the aircraft was now banking to starboard!

Flights Nos 18, 19 and 20 were completed by Henri Vanderpol, but Lecarme took the controls again on May 10, ferrying the prototype to Paris-Orly, where a meeting was due to take place four days later as the main event of the 18th *Salon de l'Aéronautique* held in the Grand Palais in Paris. The flight from Marignane to Orly took 2hr 15min, and Lecarme took off again shortly after landing for a rehearsal flight. On May 14 the SE.1010 performed well at the first flying programme to be held at the Paris show, in spite of low overcast.

Two days later Lecarme took the aircraft to nearby Villacoublay airfield for a demonstration to IGN representatives scheduled for the next day. At the end of the display, while Lecarme was coming in to land, one of the mainwheel doors came adrift and plummeted earthwards. On May 19 Lecarme flew the aircraft back to Marignane without the mainwheel doors, again in 2hr 15min. Vibration tests of the tailplane control surfaces had been completed by the end of May.

Adjustments on the prototype continued, as did test flights. Lecarme was becoming increasingly alarmed by the aircraft's aerodynamic problems and suggested more windtunnel tests, but Marnay believed that more flight testing was the way to explore further the type's flying characteristics. Flights Nos 29 and 30 were undertaken on June 17, 1949, and the SE.1010 flew again on July 2, 4 and 9, with the spoilers linked to the ailerons. The undercarriage was changed to allow take-off at 33,000kg (72,750lb) gross weight.

After the 36th flight, on September 19, the pilot noted that it was still almost impossible to fly straight with one engine shut down, and that severe flutter transmitted throughout the airframe in asymmetric power conditions.

LA TRAGÉDIE

On October 1, 1949, the weather over south-eastern France was unseasonably warm. At around 1350hr, the sky over Marignane was full of big cumuli and thunderstorms were developing to the west. Two SNCASE aircrews boarded their aircraft for another flight test of the SE.1010. Aboard F-WEEE were six crew members: pilot Henri Vanderpol; engineers Pierre Bouillon and Sylvio Agliani; radio operator Marius "Pierrot" Rivet and two mechanics, Valéry Chasson and Ferdinand Pillet. The second aircraft was LeO 453 E-10-1, with pilot Charles Duchesne and engineer/pilot André Ganivet, who had flown the SE.1010 twice, once on September 19 and again earlier that morning. His task was now to observe and film the SE.1010 jettisoning fuel through the outlet protruding beneath the tailwheel fairing. Following the fuel-dumping test, the SE.1010's crew was to investigate the action of the rudder with two engines stopped on one wing and full power on the other — a configuration Lecarme considered ill-advised and dangerous.

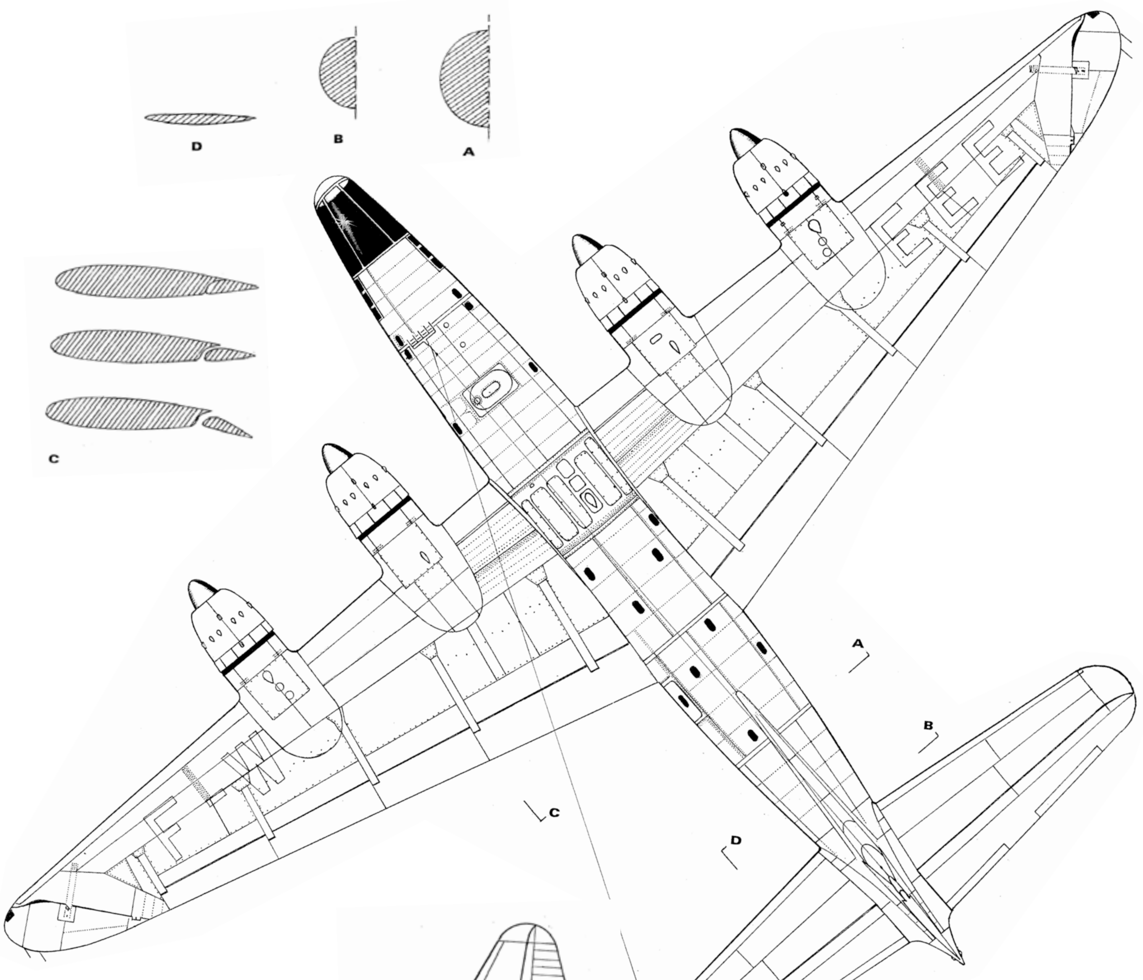
An observer from the *Centre d'Essais en Vol* (Flight Test Centre — CEV), Leblanc, had been scheduled to take a place in the SE.1010, but, after he had failed to arrive in time, the decision was made to take off without him. Both aircraft had started taxying towards the end of the runway when a Jeep arrived at full speed, carrying Leblanc. Vanderpol, however, decided to press

Continued on page 98

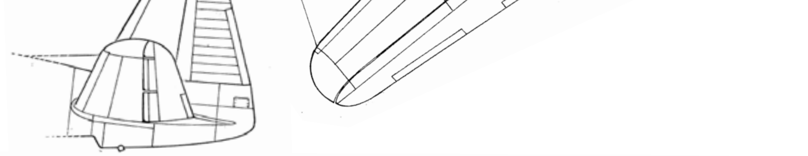
SNCASE SE.1010

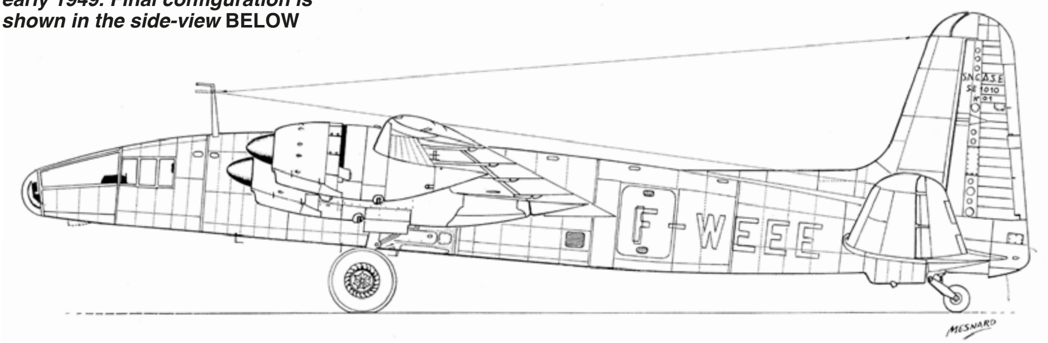
Artwork by JOËL MESNARD © 2018

Characterised especially by its long glazed nose and the unconventional Mercier ailerons fitted to its elegantly upswept wingtips, the SE.1010 was of normal all-metal construction with a circular-section pressurised cabin

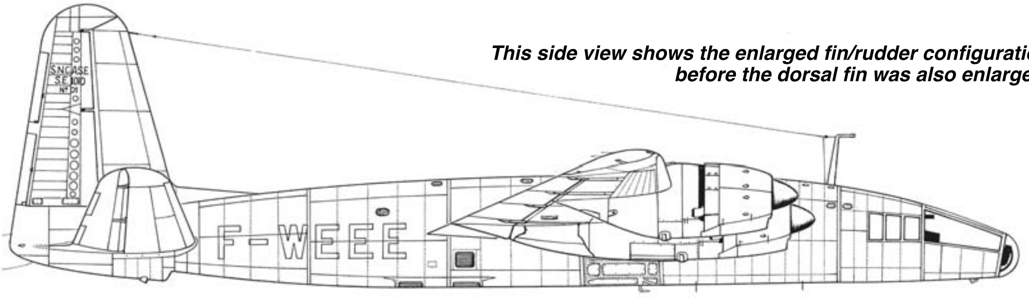


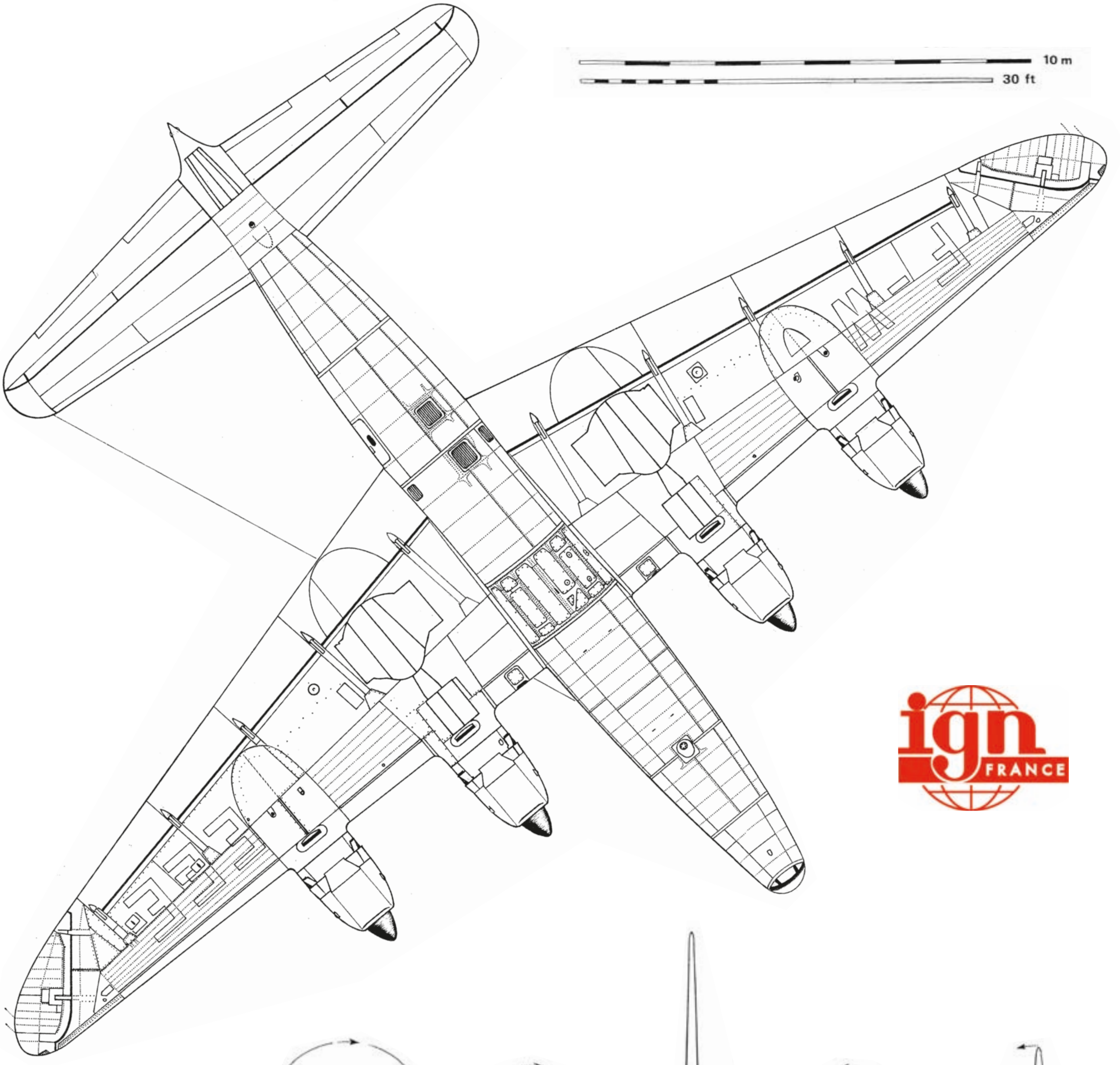
RIGHT ***Scrap view of the original shorter fin/rudder with smaller dorsal fin. The fin and rudder were enlarged before the aircraft's first flight in November 1948, and the dorsal fin's area was increased in early 1949. Final configuration is shown in the side-view*** **BELOW**

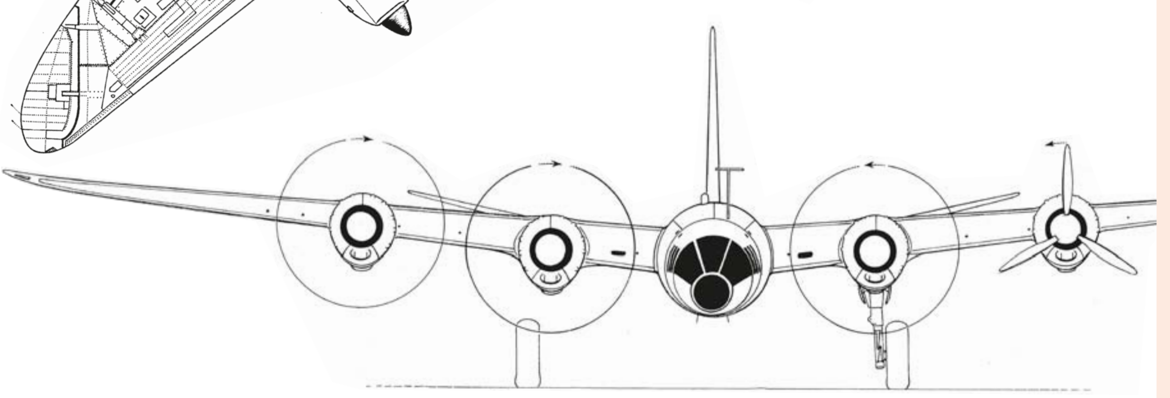




This side view shows the enlarged fin/rudder configuration before the dorsal fin was also enlarged.







TAH ARCHIVE

ABOVE ***The SE.1010 photographed from the LeO 453 accompanying it on its ill-fated last flight, on October 1, 1949. Shortly after this was taken, the pair separated and the SE.1010 undertook asymmetric power tests. The tragic result was a flat spin into a vineyard, the aftermath of which is seen*** **BELOW*****. Note the taller revised fin.***

Continued from page 95

on without him and took off at 1416hr, followed by the LeO. Both aircraft headed south-east and climbed to 1,500m (5,000ft).

The fuel-jettisoning test was repeated with satisfactory results several times, Ganivet filming the short trail of fuel. The LeO's mission was accomplished. It drew in closer to the SE.1010 and both pilots waved to each other before Duchesne broke off formation and headed back to Marignane, where the aircraft landed and the flight-test team awaited the prototype's return. The team became increasingly anxious, however, as the SE.1010 failed to return and was sending no radio messages. At around 1800hr the Gendarmerie of Carcès telephoned the airfield. The SE.1010 had crashed; there were no survivors.

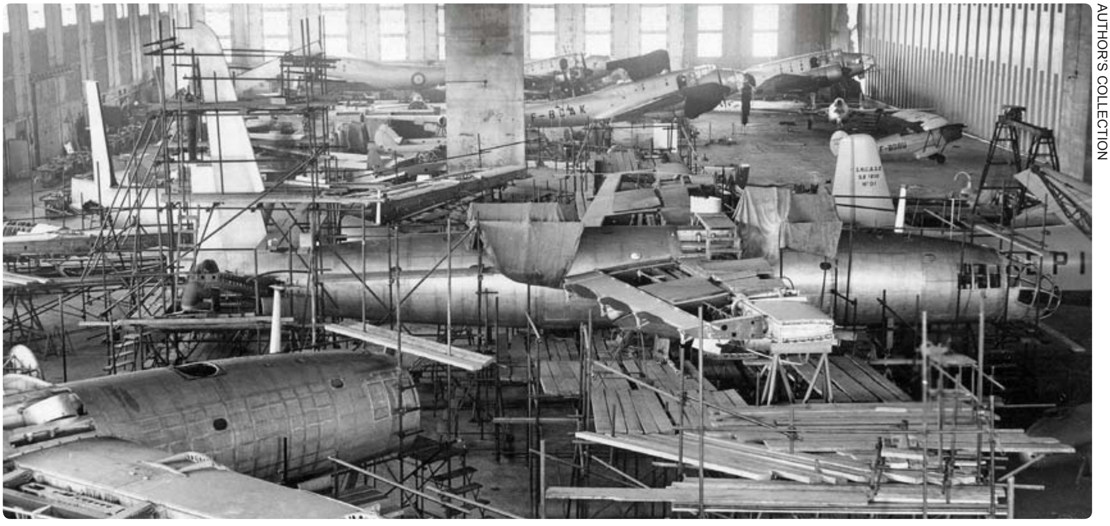
The SNCASE flight test team and members of the design bureau packed into every available car and rushed to Carcès, north-east of Brignoles in Var, to discover it was true: the aircraft had crashed into a vineyard and the six crew members had been killed. There had been no fire, but the tanks had ruptured on impact, spreading fuel among the wreckage and surroundings.

Witnesses explained what they had seen and heard. The aircraft had come down spinning around a more or less vertical axis. Lecarme's fears had proved true; in a non-symmetrical power configuration, the SE.1010 was liable to enter an uncontrollable flat spin. The pilot had tried to remedy the situation by using bursts of engine power, but to no avail. Hussenot–Baudouin flight recorders were recovered from the wreckage and proved conclusively that the aircraft had entered a flat spin. The accident report concluded that the over-compensation of the rudder had not allowed the pilot to counter the spin.

PROGRAMME CANCELLATION

The loss of the prototype and six men resulted in a tense situation and some ill-feeling among the Marignane SNCASE staff. Lecarme had been right to suggest that further tests be undertaken using a model in a windtunnel. As he related later, by ordering this dangerous and unnecessary

AUTHOR'S COLLECTION



ABOVE ***The two SE.1011s in the assembly hall at Marignane on February 28, 1950. Note the revised, shorter "drooped B-29" nose section fitted to the central airframe, just visible at the far right of the photograph. Neither of these two "production models" was ultimately completed, and the programme was cancelled shortly afterwards.***

flight, the head of the design bureau had pushed scientific curiosity too far at too great a cost.

A number of derivatives of the SE.1010 had originally been proposed, and although the three airframes slowly coming together in the Marignane assembly hall had initially been labelled as "production 1010s", they were re-designated as SE.1011s, to incorporate significant differences from the prototype. A new slightly shorter nose section had been designed and built, as can be seen on a photograph taken on March 1, 1950. Had these three airframes been completed, they would probably have been equipped with new wings without Mercier ailerons and would have been powered by Bristol Hercules engines. They were, however, scrapped when the programme was cancelled in the spring of 1950.

The number of B-17Gs used by the IGN had been reduced to three on March 11, 1949, when F-BEEB crashed at Douala in Cameroon. It was decided to rely on more surplus B-17s, and the IGN finally acquired a grand total of 13, plus one airframe used as a source of spare parts.

A variant of the SE.1010 had been designed with the outer engines replaced by Rolls-Royce Nene turbojets mounted in nacelles beneath the leading edge. The SE.1015, as it was designated, would have been a long-distance liaison aircraft intended to operate over the vast territories of the *Union Française*, and would have had a maximum capacity of only 18 passengers. Equally unrealistic would have been the SE.1020, a maritime-patrol version equipped with gun turrets and powered by four 2,000 h.p. Junkers Jumo 213s produced in France as Arsenal 12Hs. The SE.1030 and SE.1035 were stratospheric transport variants with a wider fuselage of 4m (13ft 1½in)-diameter. Yet another projected development was the SE.1040, to be powered by four Rolls-Royce Dart turboprops.

SNCASE SE.1010 DATA

Powerplant 4 x 1,230 h.p. SNECMA (Gnome-Rhône) 14R-28/29 14-cylinder two-row air-cooled piston engines driving three-bladed Ratier props of 3·5m (11ft 6in) or 3·6m (11ft 10in) diameter

Dimensions		
Span	31·0m	(101ft 8½in)
Length	21·81m	(71ft 7in)
Height	5·2m	(17ft 1in)
Fuselage max diameter	2·41m	(7ft 11in)
Wing area	116·3m²	(1,252ft²)
Weights		
Empty	16,150kg	(35,605lb)
Maximum take-off	30,280kg	(66,755lb)
Performance		
Maximum speed	565km/h	(350 m.p.h.)
Maximum speed obtained in trials	520km/h	(323 m.p.h.)
Take-off run	350m	(1,150ft)
Landing run	600m	(2,000ft)
Climb to 9,000m (30,000ft)	46min	
Service ceiling	11,000m	(36,000ft)
Normal range	7,000km	(4,350 miles)

Needless to say, none of these projects progressed further than the drawing board.

A heavy toll was exacted from test-flight crews in those experimental years; two more SNCASE crew members who had taken part in the SE.1010 programme lost their lives a matter of months after the SE.1010 catastrophe. Michel Leroy was killed in the crash of the prototype SE.2010 Armagnac in Toulouse on June 30, 1950, and Charles Duchesne died less than a month later, on July 26, when the Vampire he was flying stalled and entered an unrecoverable spin.

FROM SKATE TO SEA DART

CONVAIR & THE USA's SEAPLANE STRIKING FORCE CONCEPT

Part 1 / 1946-52

Naval aviation specialist **MATTHEW WILLIS** opens a two-part series on the development of the US Navy's Cold War-era Seaplane Striking Force concept — envisioned to offer a water-based tactical strike component for flexible global operations — with the research programme undertaken by Convair to explore the feasibility of the waterborne jet fighter

CONVENTIONAL WISDOM has it that the Second World War sounded the death-knell for mainstream waterborne aircraft, both civil and military, confining them to niche roles. In fact, the dawning of the jet age promised to spur a renaissance for seaplane warfare. The US Navy developed ambitious plans for a "Seaplane Striking Force" and attendant logistical arm for more than a decade after the end of the war. In the mid-1950s the Consolidated Vultee Aircraft Corporation (Convair) made a proposal to the US Navy for a highly mobile strike force based around a supersonic seaplane attack fighter carrying nuclear weapons. It was an audacious scheme that was intended to complement conventional carrier-based forces and "bear the relationship to the Navy's seaplane bombers that the tactical aircraft of the Air Force bear to the long-range strategic bombers."

Seaplane fighter and attack aircraft have had a long and often obscure history, despite the development of the aircraft carrier promising to make the idea obsolete. In the First World War, air arms from several nations developed small fighting floatplanes or flying-boats for coastal defence and/or protecting fleets and convoys from long-range aeroplanes and airships. The concept persisted through the inter-war period and into the Second World War. The Imperial Japanese Navy Air Force used Nakajima A6M2-N *Rufe* floatplane fighters during its campaigns in the Aleutians and Solomons. The USA and Britain tested floatplane fighters and fighter-bombers, but none reached operational service. The USA's Naval Aircraft Factory (NAF) produced a design for a "convoy interceptor" that used the buoyancy provided by watertight wings to eliminate floats. However, the necessary compromises to raise the propeller well above the water meant the design suffered from very high aerodynamic drag.

None of the Allied plans came to fruition, and when the *Rufe's* replacement, the Kawanishi N1K *Rex*, proved unable to mix it with Allied fighters or intercept bombers, it seemed that the idea may have run its course. Amphibious landings could be supported by carrier-based fighter-bombers operating from comparatively dispensable escort carriers, with no risk to important fleet carriers. However, the development of the jet engine largely ended the smaller escort carrier's usefulness, as even the smallest, lightest jet fighters could not operate from them. Furthermore, it was apparent by the early 1950s that the next generation of jet aircraft would be too large, heavy and powerful to operate even from light fleet carriers such as the *Independence*-class.

Meanwhile, the US Navy was committed to building ever-larger carriers to keep up with larger and higher-performance jet aircraft, the extreme being the proposed *United States*-class to carry strategic nuclear bombers. The increasing cost, size and importance of these fleet carriers, however, meant that operating inshore was even less viable than during the Second World War. The parallel ongoing development of nuclear weapons threatened to make the large aircraft carrier and its associated task group vulnerable in the extreme.

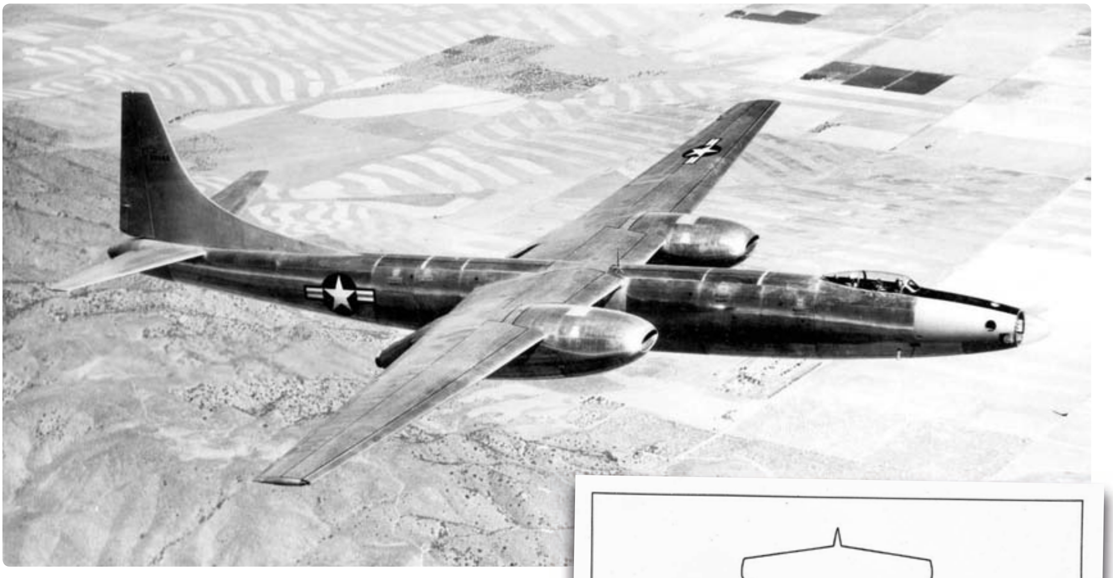
At the same time, the jet engine opened up a new range of possibilities that various companies sought to exploit, none more than Convair. The manufacturer and its predecessor, Consolidated, had established itself as the leading designer of flying-boats during the war, and it was keen to retain that position in the post-war world. At the same time, the company's engineers were acutely aware that the development of waterborne aircraft lagged behind that of their land-based counterparts, and that considerable advances had to be made to regain parity in performance.

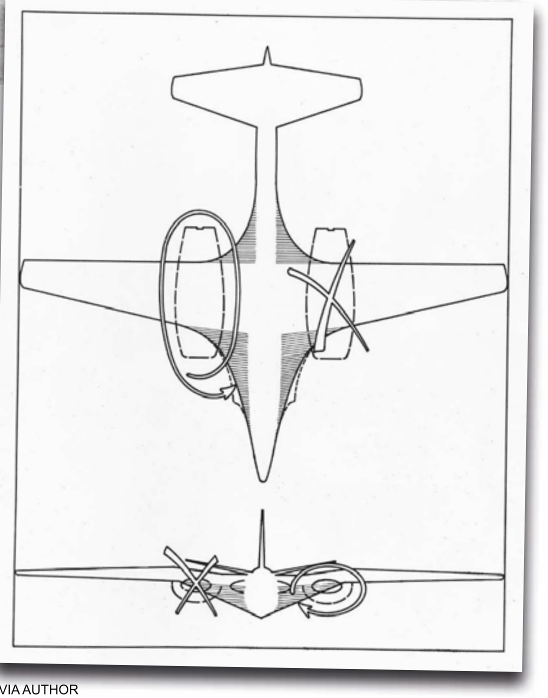
A NEW ERA FOR WATER OPERATIONS

New design approaches and the introduction of the jet engine offered a range of new possibilities. The jet engine's high power-to-weight ratio relative to piston engines meant that design solutions that had previously been impractical were now back on the table. Additionally, the need to provide clearance for a propeller was no longer a problem. Perhaps surprisingly in view of the accelerated demise of high-performance waterborne aircraft after the Second World War, in the mid-to-late 1940s the jet, with the addition of other developments in design, promised to help eradicate the severe compromises hitherto inflicted on waterborne aircraft.

Convair was given a contract by the Navy's Bureau of Aeronautics (BuAer) in 1946 to develop future concepts for waterborne aircraft, using the extensive open-water testing facilities the company had created in San Diego, California, during the war. This capability represented a huge investment in time and money to allow model testing in "real world" conditions that could not be replicated in the windtunnel or test-tank. It was, however, much harder to control variables, and the testing facilities, formed under the ægis of the Convair Hydrodynamic Research Group (CHRG), took years to perfect after their introduction in 1943.

The CHRG proved the possibility of establishing the hydrodynamic characteristics of a full-size aircraft with studies based on the Consolidated Model 31/XP4Y prototype flying-boat, and then embarked on a long-term study of a generic four-engined flying-boat model that could be fitted with different fuselages to test a range of configurations. The models had


TAH ARCHIVE


VIA AUTHOR

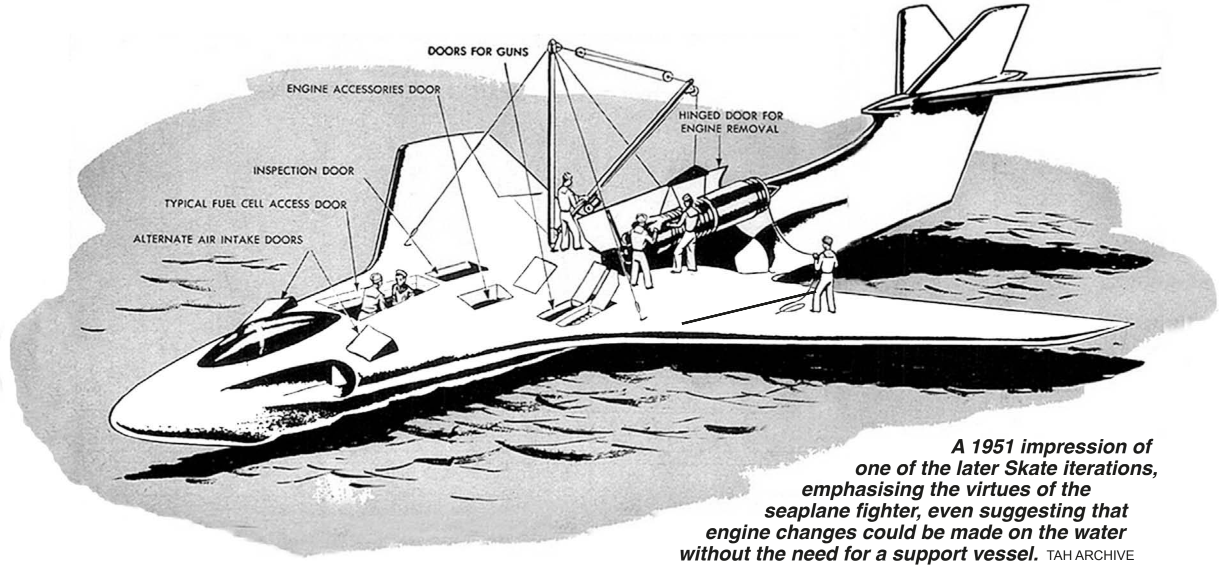
ABOVE ***The starting point for Convair's waterborne fighter project was, perhaps surprisingly, the company's four-engined XB-46 bomber, which made its first flight on April 2, 1947, although work on what would become the Skate had started back in late 1945.***

RIGHT ***A contemporary Convair illustration showing how the XB-46 design provided the basis for the first iteration of the Skate, with the removal of the wing-mounted pods containing the engines, and the latter's relocation within a revised blended hull.***

to be "dynamically similar", meaning they had to be built with comparable weight distribution and take account of scale effects rather than simply representing the external form, as in a windtunnel or tank model. They were operated by an early form of multi-channel radio control (with the operator sitting at a large control desk with full-size aircraft controls and instrument panels), which enabled full control of the model at distances of up to 3,000ft (900m), and which included fail-safes to return the controls to a pre-determined setting if the signal was cut. By the late 1940s the system was working well enough to play a major role in the design of the new XP5Y high-performance patrol bomber, which evolved into the R3Y Tradewind transport flying-boat.

Ernest G. Stout, who led Convair's San Diego seaplane design effort in the late 1940s and 1950s, spurred a breakthrough in thinking to a degree that is hard to exaggerate. Essentially, Convair under Stout's leadership broke away from the conventional wisdom that a waterborne aircraft had to incorporate a hull or floats that mimicked a boat in displacement mode when at rest or taxying below planing speed. According to magazine *Aviation Week* in its October 1, 1951 issue, Convair "ditched these old 'fundamentals' and adopted a new concept based on these premises: an aircraft is, first, an integrated vehicle designed to operate as an efficient aerodynamic configuration; and, secondly, some means must be provided to permit transition from the ground — or water — to flight and back to the take-off surface. Based on this approach, it was reasoned that all aircraft of a specific category should be highly refined aerodynamically. Carrying this thought further, the conclusion was that there need be no difference in the performance of a land- or water-based aircraft having the same aerodynamic mission".

Notwithstanding the basic premise that an aircraft's form should be defined by its aero-dynamic needs, numerous problems with water-basing still had to be addressed. These included providing enough static buoyancy (see glossary on page 103) for the aircraft to rest on the water; dealing with the considerable amount of spray encountered in high-speed taxying, and ensuring



A 1951 impression of one of the later Skate iterations, emphasising the virtues of the seaplane fighter, even suggesting that engine changes could be made on the water without the need for a support vessel. TAH ARCHIVE

the water-body could "unstick" (see glossary) at speed to facilitate take-off.

Convair began working on a design study based around its latest design, the XB-46 jet bomber, reasoning that this made the best basis for a development of a waterborne aircraft defined principally by its "aerodynamic mission", with minimum modification. Convair studied numerous configurations, including extreme length/beam ratios and light loading.

Static buoyancy The ability to float in a stable manner when at rest, separate from any upward pressure created by air or water pressure when moving

"Unstick" Water tends to exert suction and drag on the hull/floats of a seaplane, which needs to be overcome in order to "unstick" from the surface

Chine Flying-boat hulls typically incorporate a sharp angle, or "chine", where the side of the fuselage meets the vee-shaped underbody

THE "SPRAY DAM"

The solution arrived with the revival of wartime research that had stumbled across a device dubbed the "spray dam" — a flat strip which, when fitted almost perpendicularly to a vee-bottomed hull, dramatically reduced and dissipated the spray, mixing it with air. This prevented damage to the hull and flying surfaces at higher speeds and loadings from spray thrown upward, but, importantly, also did not disturb the water surface when deflected downward. (During tests on differing levels of chine-flare — see glossary — in conventional hulls, a flat strip was used to approximate different shapes of reflex in the hull bottom. The tests failed to offer any improvement in spray dispersion until the strip was adjusted, purely for experimental completeness beyond any angle through which it was expected to be useful. When angled almost perpendicular to the flat of the vee, the strip suddenly revealed a significant improvement.) Moreover, it meant that one obstacle to the adoption of deep-vee hull forms suitable for planing, the height at which spray was thrown back, was overcome. The spray dam was not appropriate for the kinds of flying-boats then in development for structural reasons, but it now promised to open new avenues in high-performance types.

In order to incorporate the spray-dam concept, the XB-46 form was altered with a wide vee-bottom. This was faired into the wing, which then necessitated a considerable fillet fore and aft in order to keep the thickness-chord ratio low. This development in itself increased the planing area of the "hull" and increased significantly the aircraft's static buoyancy. The result was a "win-win" — an aerodynamic form that offered reduced interference drag while at the same time providing sufficient buoyancy to prevent the engine intakes and exhausts from becoming inundated. Furthermore, the form offered a high degree of static stability that obviated the need for stabilising floats or sponsons. Stout coined the term "blended hull", "inasmuch as it is difficult to draw any sharp line of distinction between hydrodynamic and aerodynamic functions".[1]

In view of its wide, flat shape, it was perhaps inevitable that the new concept was dubbed the Skate. Because of the lack of propellers, the aircraft was free to sit so low in the water that the wing rested on the surface. A vee-shaped underbody allowed the hull to rise up on to the plane as speed increased, reducing drag for take-off. In September 1951 Stout wrote that "through a new blended wing/hull approach . . . it has been possible to water-base idealised high-Mach-number aerodynamic forms without compromising hydrodynamic performance".[2]

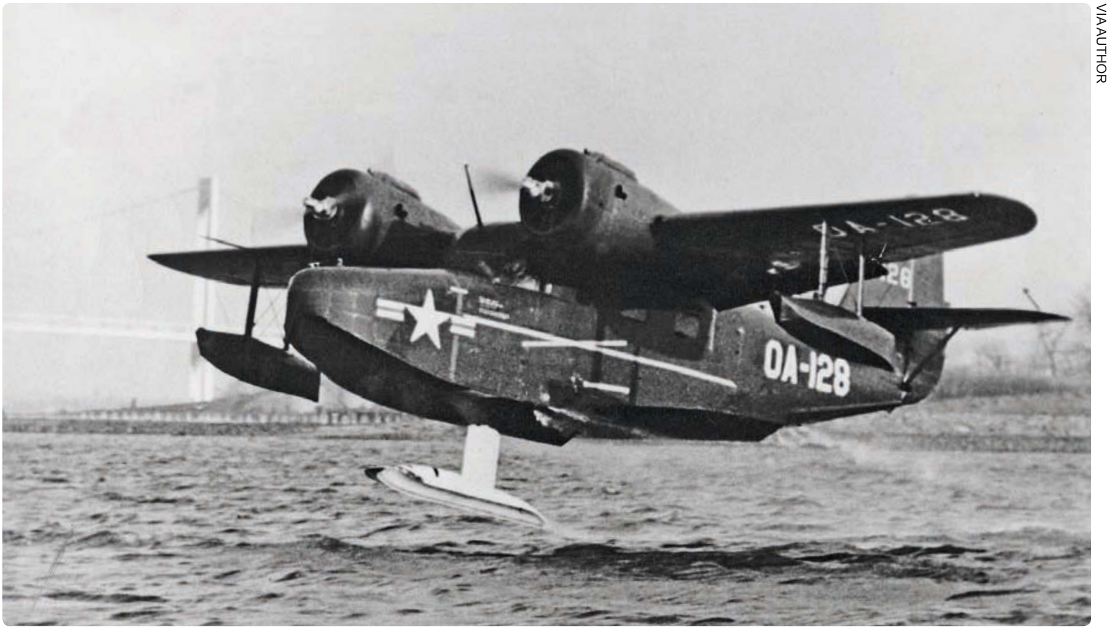
Interestingly, the National Advisory Committee

SAN DIEGO AIR & SPACE MUSEUM

A Convair technician prepares a scale model of one of the later Skate iterations, possibly the Skate 6 or 7, for alighting trials at the manufacturer's water-testing facility at San Diego. Butterfly tails had been extensively tested on various Skate configurations up to and including the Skate 5, but conventional tails were fitted to models of Skates 6, 7 and 9.

SAN DIEGO AIR & SPACE MUSEUM

ABOVE ***Members of the public inspect various Skate models during an open day in San Diego. Nearest the camera is the Skate 1, based loosely on the XB-46. Beyond that is the Skate 9, later redesignated Y2-1. Looking like a Supermarine Swift or Saab Lansen is the Skate 4, with two earlier Skate iterations, one with a V-tail, at the far end.***



VIA AUTHOR

ABOVE ***Extensive hydro-ski tests were undertaken using various types, including this Grumman JRF-5 fitted with a single hydro-ski on a fixed strut. During alighting a hydro-ski presents only a small area for impact; as the aircraft decelerates the ski takes more of the load until it submerges and the aircraft settles gently on to the surface.***

for Aeronautics (NACA) undertook water-tank tests of the NAF convoy interceptor in 1947, long after the design itself was obsolete, but just at the time the BuAer was becoming serious about seaplane fighters again.[3]

At least nine versions of the Skate were penned, beginning with the evolved XB-46, dubbed "Skate 1", with straight wings and a low-set tail. Further developments included the Skate 2, a swept-wing variant with a butterfly tail, and a Navy mission study single-engined development with a prone pilot occupying a clear nosecone. Related projects include a 1947 scheme for a heavily armed single-seat single-engined version with multiple cannon and 30 unguided rockets in the leading edges.

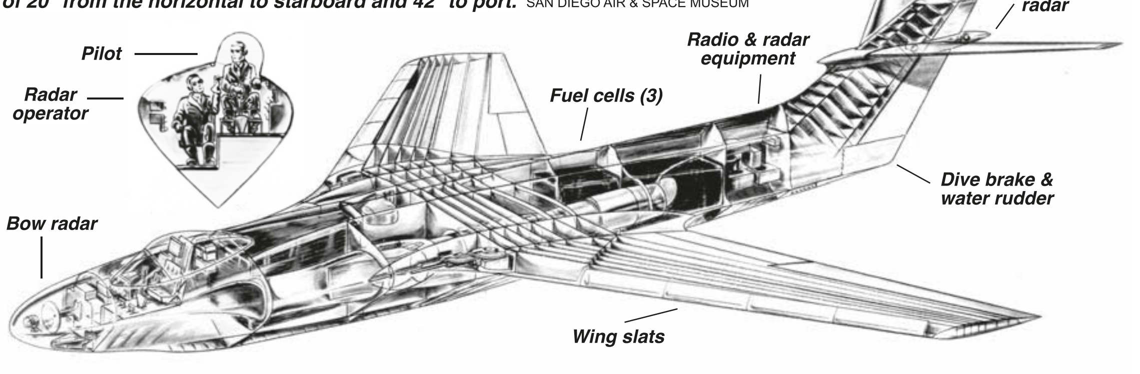
The Skate was developed in attack, fighter and nightfighter forms. The size varied somewhat between versions, but all had a prospective span of around 62ft 6in (19m), were between 82ft (25m) and 83ft 8in (25·5m) in length and had a gross weight of 33,000–46,000lb (14,950–20,850kg). Apart from the straight-winged Skate 1, most versions had a 40° swept wing, and typical power was to be provided by two Westinghouse XJ40-WE-10 jet engines, offering a total of around 15,000lb-thrust.

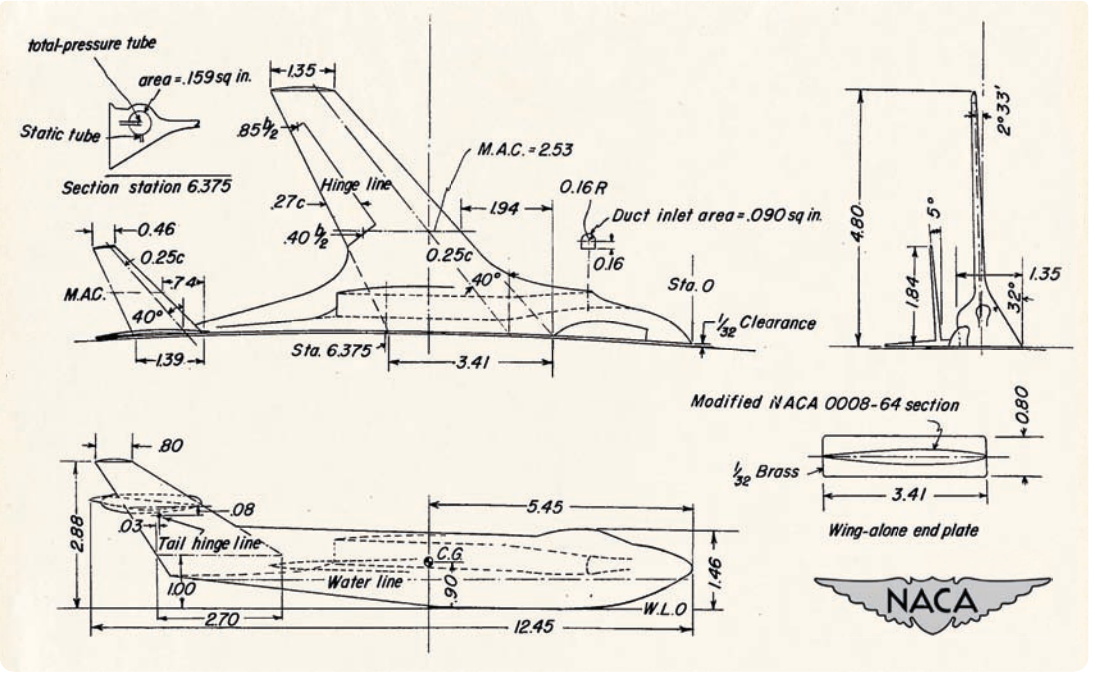
THE HYDRO-SKI

While Convair was busy developing the Skate's blended-hull form utilising spray dams, an even more radical means of permitting high-performance waterborne aircraft was gestating — the hydro-ski. As the name suggests, this was a ski on which the aircraft rose up in lieu of planing.

By the time the Skate was under consideration NACA had undertaken extensive model tests with hydro-skis. A report issued in December 1947 stated that "jet propulsion offers an opportunity

A contemporary cutaway illustration of a later iteration of the Skate, in which the crew is accommodated side by side, but with the radar operator seated lower within the fuselage; the pilot's canopy is offset to port, providing a downward field of vision of 20° from the horizontal to starboard and 42° to port. SAN DIEGO AIR & SPACE MUSEUM





VIA AUTHOR

ABOVE ***A NACA drawing of the 1/80th-scale model of the Skate 9, with all dimensions in inches (and a curiously curved plan-view centreline). The Skate 9, the final configuration for the Skate concept study, a nightfighter version of which was designated Y2-1, had an estimated top speed of 640 m.p.h. (1,030km/h) at 35,000ft (10,700m).***

[to eliminate] the troublesome propeller from waterborne [aircraft] and thus enables radical changes to be made in high-speed seaplanes".[4] NACA collaborated with the Edo Corporation, which had proposed a ski undercarriage for operations from water, snow and ice. Tests of hydro-skis were made on a models of a Douglas D-558-2 Skyrocket and a swallow-tailed research aircraft of Edo's own design, and using a full-size ski on a Grumman JRF-5 amphibian.

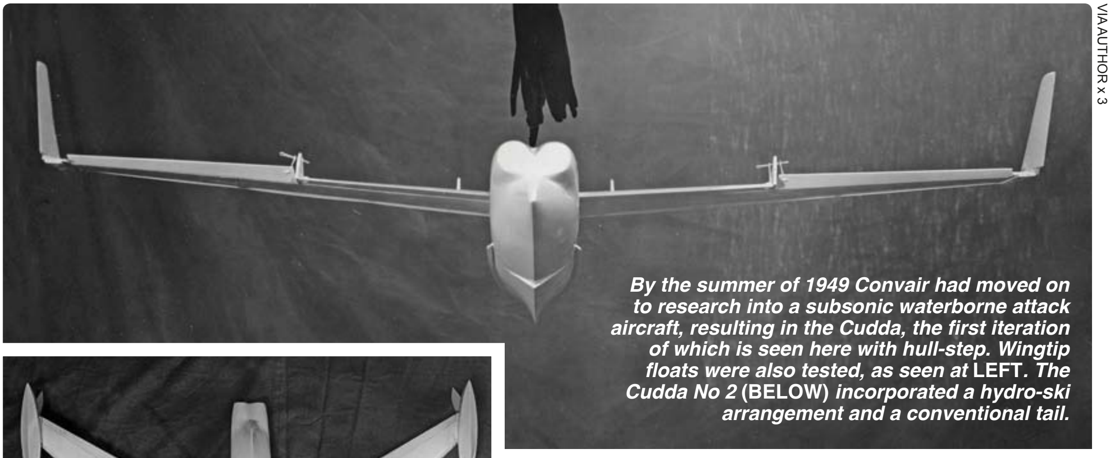
By June 1948 the US Navy was becoming increasingly interested in the prospect of an interceptor that could protect against air attack where land- or carrier-based aircraft could not. After a conference was held to discuss the various options, Outline Specification OS-114 was issued for just such a single-seat interceptor. When a second conference took place at the end of the month to firm up the details, however, the requirement was changed to a two-seat radar-equipped night-fighter, and Outline Specification OS-116 was raised to cover this.

Another consideration was to use the fighter as a scale research model for larger jet seaplane bombers that the Navy was considering. Up to this point, the process had chiefly been a matter between Convair and the BuAer, but in 1948 the decision was made to open it up to competition. While many manufacturers were informed about the specification, only two, Convair and Curtiss, made submissions. Convair's offering, a variant of the Skate concept, was powered by a pair of afterburning Westinghouse J40 engines, while Curtiss proposed a hydro-ski fighter. Outline Specification OS-116 therefore provided, on paper at least, a good opportunity to test the two concepts against each other.

Although the Convair design's cockpit arrangement — with the pilot's cockpit offset to one side and the radar operator position buried in the fuselage — was commented on unfavourably, the Skate effectively won hands-down. "The very high wing-loading and thrust-loading of the Curtiss design makes its altitude performance so poor as to be unacceptable, and makes its take-off performance marginal", concluded the BuAer. It continued: "The major advantages of the Curtiss design are its smaller size, weight and cost and possibly better rough-water performance. The Convair Skate has such a marked superiority in climb, altitude and take-off that it is obviously the winner of this competition".[5]

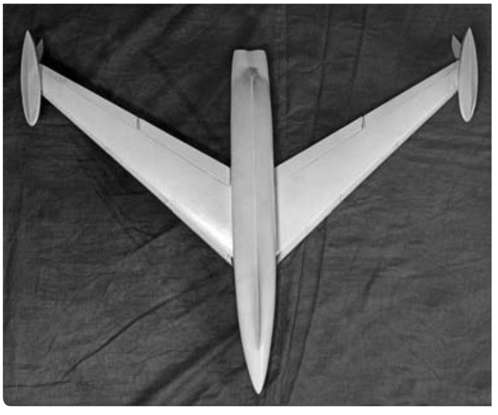
Despite this ringing endorsement, the BuAer memo also noted that there was a shortfall of \$3·9m between the funding allocated for 1949–53 and the cost of a Skate prototype and its attendant development programme. Worse, the necessarily slow pace of development meant that the resulting aircraft would be obsolescent by the time it flew. Nevertheless, Convair was given a contract for further development work, including on configurations, for a waterborne nightfighter.

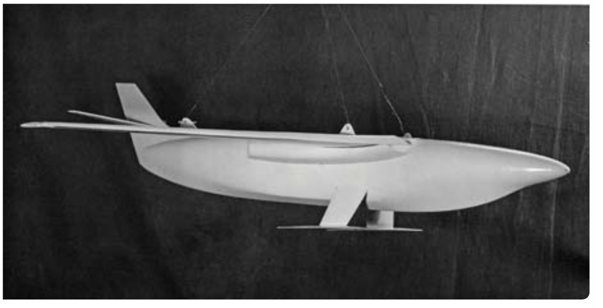
Part of the problem was that the waterborne fighter was not at this time part of the US Navy's vision for its own strategic role, which until the sudden cancellation of the *USS United States* was



VIA AUTHOR x 3

By the summer of 1949 Convair had moved on to research into a subsonic waterborne attack aircraft, resulting in the Cudda, the first iteration of which is seen here with hull-step. Wingtip floats were also tested, as seen at LEFT. *The Cudda No 2* (BELOW) *incorporated a hydro-ski arrangement and a conventional tail.*





focused on carrier-based nuclear strike. It thus had a lower priority, leading to the shortfall in funds, despite the BuAer's continued interest in the concept. Having invested so much time and energy into the Skate concept, Convair sought to widen the aircraft's appeal. The company continued to use its open-water testing facilities at San Diego to conduct a range of studies with models, including the possible use of a submarine as a parent vessel for a Skate.

THE CUDDA . . .

By April 1949, however, the BuAer had called time on the Skate. It was firmly transonic, when the future of naval fighters, even carrier-based, was supersonic. Moreover, it was limited as to the sea state it could operate in, with waves bigger than 5ft (1·5m) problematic for water handling.

The BuAer opened up a new avenue. According to Convair specialist Robert E. Bradley, "Convair was informally requested by the Navy in March 1949 to suggest additional types of aircraft around which future additional work could be undertaken under the high-Mach-number seaplane section of the ongoing [Skate] research contract".[6] This was based on two earlier requirements, OS-111 and OS-115, for a long-range subsonic carrier-based attack aircraft, and a more advanced supersonic (M1·2) type, which Convair was effectively required to water-base. The requirements for range and payload were the same for both types, suggesting that the Navy expected the supersonic version to take somewhat longer to bring into service.

By late June 1949 Convair had produced the first model in a new series of designs, the Cudda, for the subsonic scheme. According to Bradley, "the transonic [sic] Cudda configurations were designed around the requirement to deliver a 10,000lb [4,540kg] payload 1,700 nautical miles [3,150km] at a speed of M0·85 at an altitude of 40,000ft [12,200m]. It was envisioned that the Cudda would operate out of a home base but be supported from an extended base; either another [aircraft], a surface ship or a sub-surface boat".

The Cudda No 1 represented a radical departure from the Skate, but in many respects was a natural development of the concepts that had been employed to develop it. The blended wing/body was dispensed with in favour of a conventional shoulder-mounted wing less likely to be affected by a heavy sea. However, the opportunity afforded by spray-dams to employ a slim deep-vee fuselage, in which the engines were buried, was seized upon.

The first incarnation of the Cudda lacked any tail surfaces apart from small fins at the wingtips, and the design was tested with and without a step in the underbody. Owing to the change in configuration from the blended hull, it was felt that wingtip floats may be required (models were tested with and without floats) but the San Diego design team took the opportunity to incorporate these to act as an aerodynamic afterbody to restore directional stability lost through the lack of a conventional tail. (A photograph of the

VIA AUTHOR

ABOVE ***The Cudda No 3 was a development of the No 2, and incorporated a cockpit and a revised hull with chine strips. The full-scale 112ft 3in (34·2m)-long version was to have had a span of 88ft 8in (27m), with a wing area of 1,122ft^2 (104·2m^2). The prospective powerplant was a pair of Westinghouse XJ40-WE-14 afterburning turbojets.***

Cudda No 1 test model has been edited in such a way as to suggest that a conventional fin may have been added to the model at one point.)

Successive models were in some respects more conventional, restoring the orthodox afterbody and tail, and moving the engines back to the wing roots. While Convair had previously shown no interest in the hydro-ski (although NACA had tested a Skate 7 model fitted with hydro-skis), from the Cudda No 2 onwards the design was tested with skis, beginning in December 1949. These were virtually identical to the surfaces NACA had tested on the D-558-2 model. The Cudda No 2 towing model did not have any external cockpit, but general arrangement drawings indicate a conventional blister canopy on the centreline.

The Cudda No 3 was very similar, and this time the model incorporated a conventional cockpit as well as additions such as chine strips around the forward fuselage and slightly less sweep on the wing's leading edge. The Cuddas were large aircraft, with prospective spans of around 87–88ft (26·5–26·8m), and a gross weight of around 110,000–115,000lb (49,900–52,200kg).

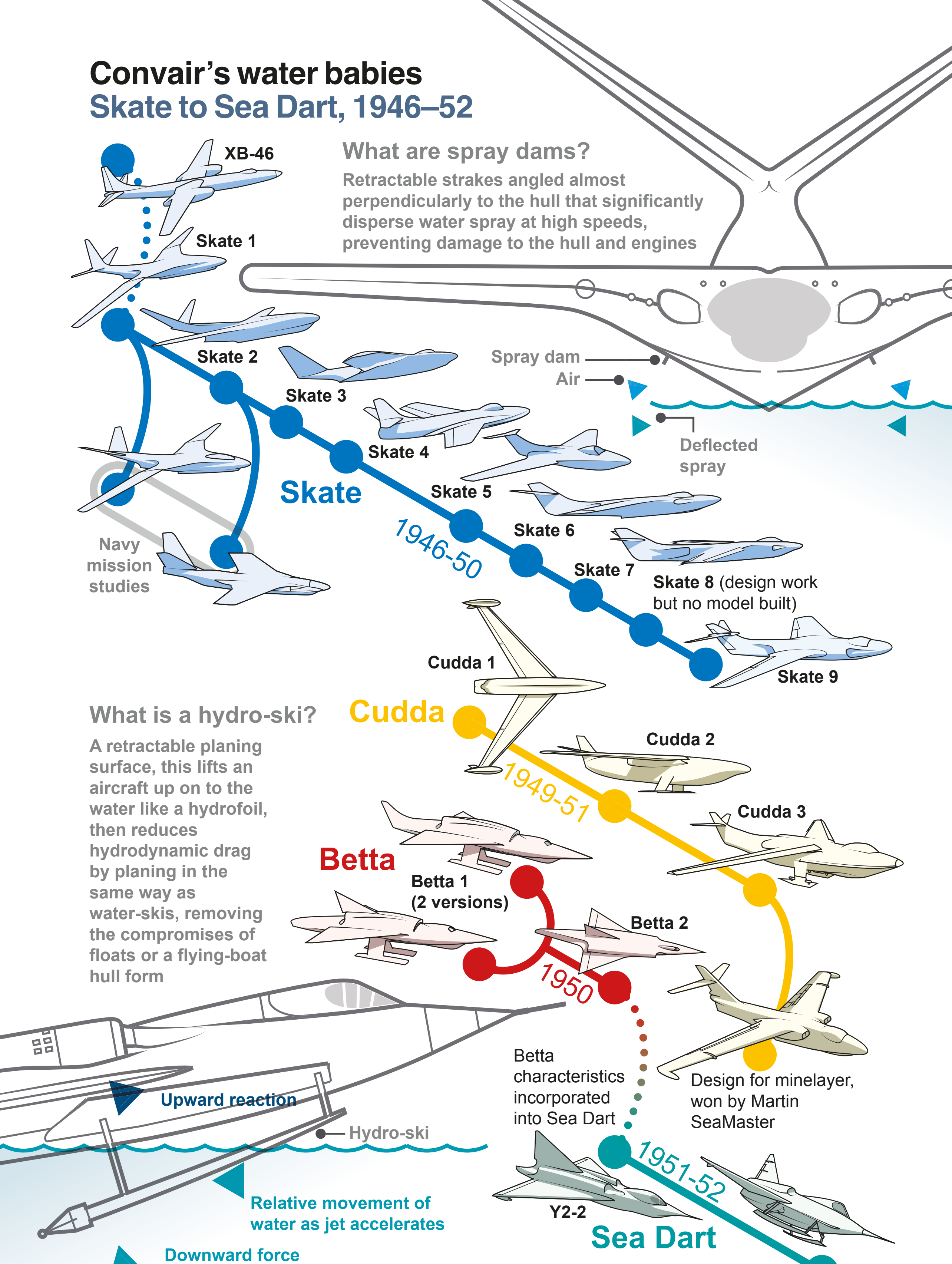
The following year, 1950, saw a different branch of experimental research introduced into the seaplane strike-aircraft programme for the supersonic requirement. Once again, Convair reached into research from other programmes within the company. The delta-wing scheme of the Model 7002 (later XF-92) was introduced to a post-war interceptor programme drafted at the Downey (former Vultee) division, probably at the instigation of the chief technical engineer at San Diego, Adolph Burstein, who, according to Convair's in-house newspaper, *Convairiety*, was "one of the first to advocate the delta wing".[7]

Interest in the delta planform was probably spurred by the Lippisch LM-1 experimental delta brought to the USA during the Second World War and tested extensively in NACA's full-size windtunnel. The XF-92 was tested in model form in 1947 and flew in September 1948, demonstrating considerable promise for improved performance and solving various problems associated with highly swept wings.

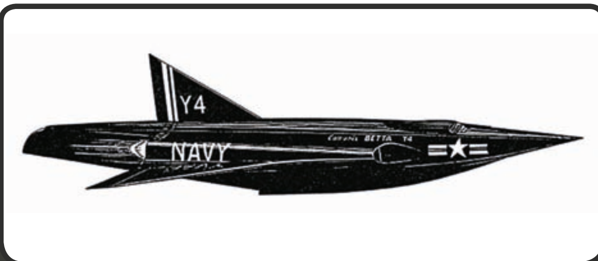
. . . AND THE BETTA

With the seaplane strike aircraft, delta wings made even more sense, as the large wing provided good static buoyancy while retaining a suitable thickness-chord ratio for high-speed flight. The Betta family saw a return to the Skate's blended

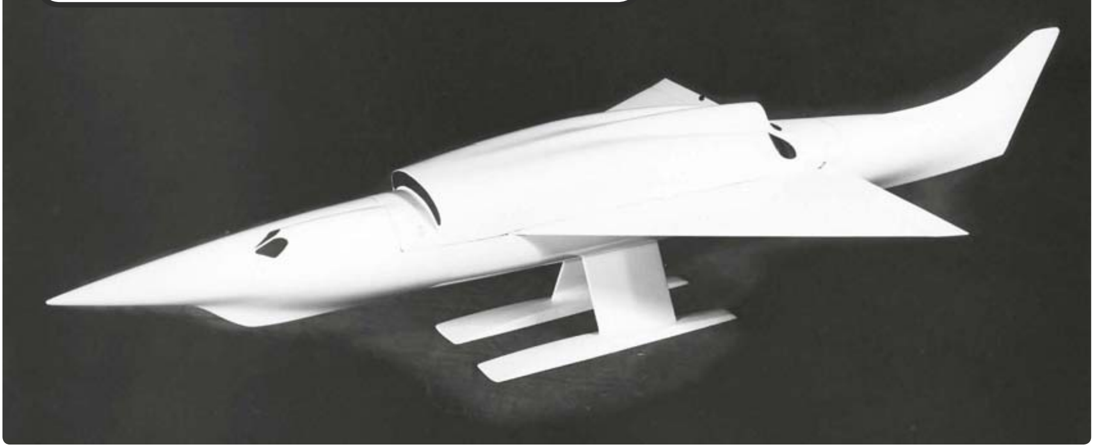
Convair's water babies
Skate to Sea Dart, 1946–52



Graphic: Ian Bott and Neil Fraser



LEFT ***Resembling an exotic deep-sea fish, the Betta No 2 returned to the blended wing/hull configuration developed during the Skate studies, dispensing with the Betta No 1's hydro-skis. Both Nos 1 and 2 were extensively windtunnel-tested during the first half of 1950.*** VIA AUTHOR



SAN DIEGO AIR & SPACE MUSEUM

ABOVE ***The futuristic Betta No 1 was a study for a supersonic waterborne attack aircraft, and incorporated a small 60°-swept delta wing, twin retractable hydro-skis and three fuselage-mounted General Electric J53 engines without afterburners fed by a crescent-shaped air intake mounted on the upper surface of the fuselage, plus a small fin.***

wing/hull form with an elongated dart-spindle-shaped fuselage in the Betta No 2, which was matched against the Betta No 1, more orthodox in its fuselage but fitted with hydro-skis similar to those tested on the Cudda Nos 2 and 3. The delta wings were mid-mounted on the Betta Nos 1 and 2's long fuselages, with engines buried in the wing roots. The Betta No 1 had a single air intake, which was mounted atop the fuselage behind the cockpit. The Betta No 2 had wing-root intakes, similar to those on the Cudda and Skate. The Betta No 1 had a small swept fin fitted at the extreme aft end of the fuselage, while the Betta No 2's tail was closer to that of the XF-92 in appearance; a large triangular fin mounted much further forward, its trailing edge in line with the wing trailing edges.

The Bettas were also large aircraft, with a prospective gross weight of around 150,000lb (68,000kg), and were to be powered by two General Electric J53s, an engine destined never to leave the drawing board. Work proceeded on the Betta throughout 1950 but does not appear to have been continued much beyond the end of the year. The Cudda programme, minus the hydro-skis, evolved into Convair's response to OS-125 of May 14, 1951, for a large seaplane bomber, the so-called "Long Range Aerial Mine-Layer" (which was eventually won by the similarly configured Martin P6M SeaMaster). It may be that the supersonic seaplane bomber was simply too ambitious and/or too expensive. However, once again the BuAer offered Convair a way forward, returning to an idea that had been raised during the Skate programme — the development of an experimental small fighter that could be scaled up into a bomber or attack aircraft if successful.

AN ORDER TO BUILD

This led — finally — to an order for hardware. Contract 51-527 was issued to Convair in January 1951 for a small delta-winged hydro-ski-equipped jet, the Y2-2 (Y for Service-test model, No 2, second iteration[8]) later designated XF2Y by the US Navy. This aircraft incorporated many of the characteristics of the Betta, but also strongly resembled the similarly-sized XF-92 fighter. Model-testing rapidly evolved improved forms of the skis as a result of continued hydrodynamic testing by Convair. Between the first Betta model appearing in early 1950 and NACA concluding initial tank model tests of the Y2-2 in August 1951, the skis had changed dramatically. The 1949–50 form of short, relatively broad surfaces set at an angle similar to the aircraft's own axis had evolved to become much longer, narrower and angled up at the nose, fitted with shock-absorbing struts at the rear.

A clue to the reason for this rapid evolution can be drawn from various studies, including the 1947 tests on a model based on the D-558-2, which indicated that "for a fixed angle of attack, as the ski approaches the water surface, the lift drops rapidly to a planing lift that is only about one-

half the lift obtained in the deeply submerged condition. This decrease in lift will cause the ski to resubmerge when it breaks the water surface and rise again when the flow is re-established. The ski will oscillate between planing and deep submergence. One obvious way to avoid such an oscillation is to increase the angle of attack sufficiently to obtain planing lift equal to the submerged lift".[9]

The Y2-2 as tested in model form in 1951 is recognisable as the aircraft that would fly in 1952 as the XF2Y-1 Sea Dart. The F2Y is often presented as being contemporary with the USAF's Convair F-102 Delta Dart to the extent that some sources suggest it was "an F-102 on water-skis". In reality, the Y2-2 sits between the XF-92 and the F-102, and arguably owes more to the former. It is presented as a sea-going partner to the XF-92 in much of Convair's contemporary literature, and as such, it was somewhat behind the state of the art when it first flew, just ahead of the YF-102.

The prototype XF2Y-1 was fitted with Westinghouse J34 powerplants, while pre-production and production aircraft were intended to have more powerful J46 engines. It was a far cry from the huge strategic bombers anticipated by the earlier programmes, but Convair was optimistic that it would prove the concept and demonstrate the practicality of operating from remote water bases, and perhaps pave the way for more ambitious machines. The following year, Convair's efforts would seem to have paid off handsomely with the conception of a substantial force of waterborne aircraft — the Seaplane Striking Force.

1 Stout, Ernest G, *A Review of High Speed Hydrodynamic Development*, 1951, p255
2 Ibid, p266
3 Wells, Evalyn G. and McKinney, Elizabeth G., *Wind-Tunnel Tests of a ¼-scale Model of the Naval Aircraft Factory Float-Wing Convoy Interceptor,* TED No NACA 2314, Langley Memorial Aeronautical Laboratory, Langley Field, Virginia, USA, January 1947
4 Dawson, John R. and Wadlin, Kenneth L., *Preliminary Tank Tests Of NACA Hydro-Skis For High-Speed Airplanes*, Langley Memorial Aeronautical Laboratory Langley Field, 1947
5 US Navy Department Bureau of Aeronautics Confidential Memorandum, *Model VF Seaplane Night Fighter — Recommendation on Design Competition*, April 5, 1949
6 Bradley, Robert E., *Convair Post World War II Seaplane Studies, Part 1, Aerospace Projects Review* Vol 2, No 4, p12
7 *Convairiety*, May 18, 1955
8 Yenne, Bill, *Convair Deltas — From Sea Dart to Hustler,* Specialty Press, 2009, p109
9 Wadlin, Kenneth L., *Considerations Affecting Hydro-Ski Airplane Design*, Langley Aeronautical Laboratory, July 1953, p6

NEXT TIME *The author details the development of the US Navy's Seaplane Striking Force concept, and how it informed, but ultmately lost out to, the Polaris system*

BELOW ***Splash one MiG! A speculative impression of a butterfly-tailed, prone-pilot, single-engined Skate 2 variant in action with the US Navy in the skies over Korea. Artwork by IAN BOTT & NEIL FRASER © 2018***

The John Stroud Archive

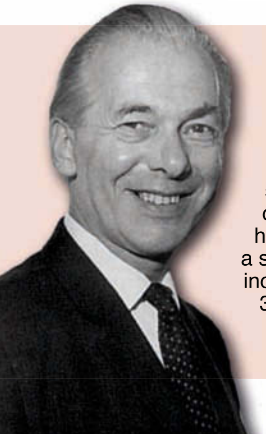
CHANNEL-HOPPING WITH BEA

In April 1947 aviation journalist John Stroud boarded a BEA Dakota at Northolt with the objective of sampling the newly-minted organisation's extremely profitable Channel Islands service; **NICK STROUD** (no relation!) takes a look at the history of civil aviation in the islands alongside some of John's previously unpublished photos

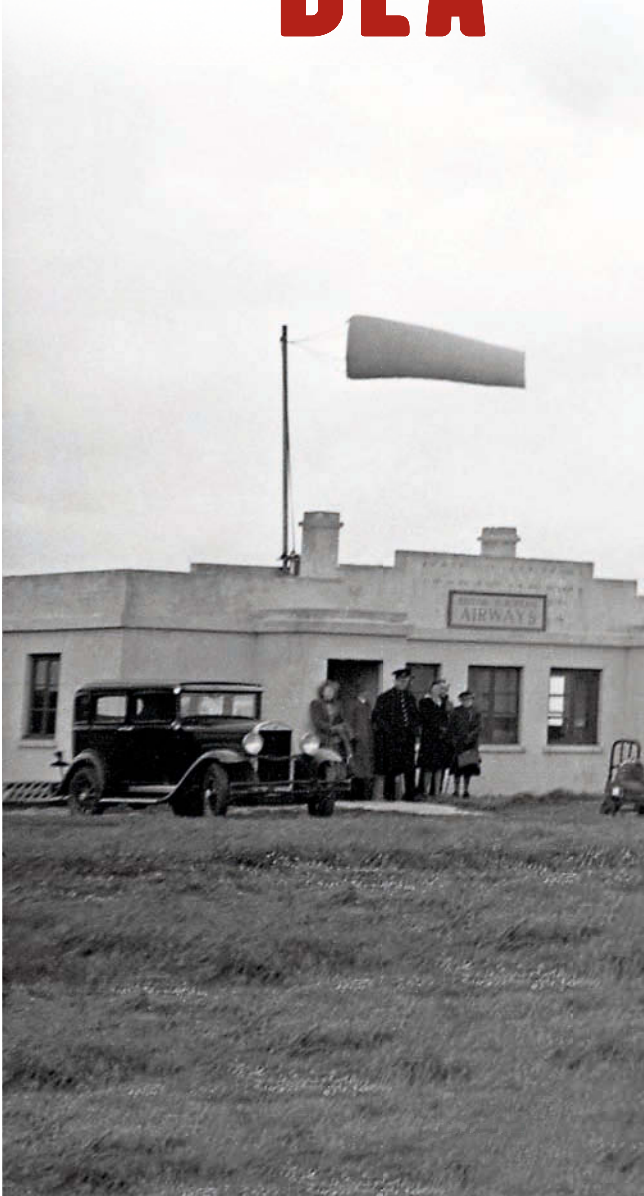
THE LATE WINTER and early spring of 1947 proved to be a characteristically busy time for John Stroud, the intrepid aviation journalist having flown on the inaugural non-stop Junkers Ju 52/3m Croydon—Belfast service operated by the newly-established British European Airways (BEA) on March 20 that year (as described in *To Belfast, By Jupiter!* in *TAH17)*. Little more than a month later John was off again with BEA to sample another of the carrier's regional routes, this time to witness at first hand what was described at the time as the nationalised airline's most profitable operation: the Channel Islands service.

CHANNEL ISLAND AIRWAYS

When BEA came into being in August 1946, the Channel Islanders' air needs had long been met by Channel Islands Airways (CIA), an amalgamation of Jersey Airways and Guernsey Airways, both of which had been serving the States since the early



Born on April 3, 1919, John Stroud joined Imperial Airways aged 14, and six years later became a freelance aviation writer. In 1963 he was appointed General Editor of the Putnam series of aeronautical books, and continued to publish material until his death in March 2007. In 2014 a substantial part of John's archive, including rolls of previously unseen 35mm film, was acquired by A Flying History Ltd, and forms the basis of this regular *TAH* series



Three of BEA's Rapides beside the terminal at Guernsey on April 30, 1947. The nearest, G-AGSH (c/n 6884) and the furthest, G-AGPH (c/n 6889), were both operated by Channel Islands Airways before the latter became part of BEA in the nationalisation process in 1946; G-AHXZ (c/n 6825) had joined BEA from the Ministry of Supply in September 1946.

BELOW *With a stiff breeze blowing over the landing field at La Grand Blaye on Alderney, Rapide G-AGSH is prepared for its return hop back to Guernsey, and then on to Jersey, during John Stroud's visit to the Channel Islands at the end of April 1947. Although the smallest of the three islands by some margin, Alderney can boast the first licensed airport in the Channel Islands, having opened in October 1935.*

Rapide G-AGSH awaits another inter-island flight at Jersey. This aircraft made its first flight in April 1945 and joined Channel Islands Airways three months later, before being absorbed into the BEA fleet in early 1947. The initial BEA colour scheme was somewhat austere, the Rapides being silver overall with the airline's "Speedkey" logo within a red circle on the fin and "British European Airways" running discreetly beneath the cockpit and forward cabin windows.

1930s. Jersey Airways was originally formed in December 1934 to provide an air service connecting the largest of the Channel Islands to the mainland, with de Havilland D.H.84 Dragons operating services from London and Portsmouth to the sands at West Park, part of the beach area between St Aubin's Bay and St Helier. Guernsey Airways was established in June 1935 to become a fellow subsidiary, with Jersey Airways, of CIA, and initially operated amphibian aircraft, as detailed in Matthew Willis's *Trimotors Over The Channel* in *TAH23*.

All services to and from the mainland, however, were curtailed abruptly with the invasion of the Channel Islands by German forces in June 1940, and it was not until the liberation of the islands in May 1945 that a civil British aircraft set its wheels down at Jersey again. This was de Havilland D.H.89A Dragon Rapide (henceforth referred to simply as Rapide) G-AGLP, in the hands of Jersey Airways' pre-war general manager Cdr G.O. "Jo" Waters, on May 26 that year, Waters having been sent to assess the prospects for resuming air services from the mainland.

After numerous trial flights and feasibility studies, regular services between Jersey, Guernsey and Croydon began, using Rapide G-AGPH on June 21, 1945. Within a month, the service had increased to three times a day. Inter-island services between Jersey and Guernsey resumed shortly afterwards, undertaken by the Rapides of both Jersey and Guernsey Airways, operating under the umbrella organisation of CIA. Services were also opened to Southampton, and in February 1946 Alderney was added to the timetable too.

Demand for the services was high, and in June 1946 Bristol 170 Wayfarer G-AGVB was leased from the manufacturer and added to the eight Rapides then comprising the CIA fleet. With business booming by the summer of 1946, the future looked decidedly rosy for the airline. The election of a new Labour government back in July 1945, however, had heralded dark clouds on the not-too-distant horizon for CIA.

UNDER NEW MANAGEMENT

With the new government's rationalisation of Britain's airline structure, there were to be three new state-subsidised and -run air carriers for scheduled services: BOAC for "Empire" and long-haul routes; British South American Airways to serve South America, and BEA to operate domestic and short- to medium-haul European routes. Technically, CIA had been operating since the beginning of the war as part of the Associated Airways Joint Committee (AAJC), but the temporary wartime operating agreements binding CIA and the AAJC expired at the end of January 1947 — what would happen thereafter?

A month-long battle between the government and CIA ensued, the latter fighting to retain its independence, demanding that the unique positioning of the Channel Islands in relation to the mainland be taken into consideration, and claiming that the islands lay outside the jurisdiction of the 1946 Civil Aviation Act (essentially the instrument of nationalisation). There were to be no exceptions, however, and CIA was forced to cede to the government's nationalisation policy and relinquish all its operations in favour of BEA. Accordingly, the last CIA flight was made on March 31, 1947, and the following day CIA became part of BEA.

On the positive side for CIA's erstwhile workforce, BEA's rates of pay were noticeably higher — but the new corporation managed to undermine any goodwill on this account by

BELOW *Three BEA Rapides, all former Channel Islands Airways aircraft, sit together on the hardstanding at Jersey, its distinctive diagonal paving completed by the German forces after their invasion of the Channel Islands in June 1940.* **INSET BELOW** *Islanders make the most of the view from Rapide G-AGSH as it trundles between Jersey, Guernsey and Alderney.*

sending new uniforms, stationery, staff and other items to the islands aboard a Ju 52/3m, the stalwart of the wartime Luftwaffe and a regular sight on the Channel Islands during five long years of Nazi occupation. This wildly insensitive reminder notwithstanding, things settled down and the Channel Islands services were absorbed into BEA's English Division.

On April 21, 1947, BEA inaugurated its London—Jersey service using Douglas Dakotas from Northolt, the organisation's main base to the north-west of London, replacing the previous Rapide service from Croydon, although the biplanes continued to serve on the Croydon—Guernsey service until that November. By the summer, BEA was operating some 42 flights a week between Northolt and Jersey, although Rapides still accounted for the lion's share of BEA flights from the mainland, mainly Southampton, with the ageing biplanes accounting for 44 flights a week to Jersey, 40 to Guernsey (including those from Croydon) and two to Alderney.

THE CHANNEL ISLANDS AIRPORTS

Unlike those on the mainland, the airports in the Channel Islands were not owned or controlled by the British Ministry of Civil Aviation, but were run independently, albeit along similar lines. Jersey Airport, set on a plateau overlooking St Ouen's Bay in the parish of Saint Peter, was officially opened on March 10, 1937, by Mrs Coutanche, the wife of the Bailiff of Jersey, and was baptised with the arrival of several D.H.86s of Jersey Airways from Heston, near London. Owned by the States of Jersey, the new airport was administered and controlled by the Harbours & Airport Committee, which was responsible for radio equipment, meteorology, air traffic control, ground services and airport maintenance. There were no hard runways, but the all-grass field was well-drained and made an excellent landing ground.

One of the first problems encountered at Jersey, particularly during the summer months, was the formation of low stratus that quickly enveloped the island and caused problems with take-offs and landings, usually made along the longest part of the field, which ran along the east/west axis. Extensions of the original landing ground were planned and started before the war, and the Germans, with customary efficiency, demanded they be completed during the occupation. Thus, by the beginning of post-war civil operations, a total run of 1,250yd was available at the airport. The buildings at the new airport incorporated offices for services, passenger handling, Customs and air traffic control, and were described in British weekly *Flight* at the time as "elegant, well-planned and practical".

Guernsey had to wait another couple of years to open its own commercial airport, although a small strip at L'Erée on the island's west coast had been used by the Guernsey Aero Club since the early 1930s. On May 1, 1939, Sir Kingsley Wood, Secretary of State for Air, opened the new airport at La Villiaze on the highest point of the

Passengers disembark from G-AGSH and make their way to the single-storey building at Alderney Airport — "terminal" may be too grand a word! The airport has been gradually upgraded since John's visit in 1947 and, although not as busy today as it was in the 1970s and 1980s, Alderney still services more than 9,700 aircraft movements each year.

island, about three miles (5km) from St Peter Port. As with Jersey, the airport was not owned by the Air Ministry, but by the States of Guernsey, with the Airport Sub-Committee of the Board of Administration being responsible for all civil aviation activities on the island. On its opening, Guernsey was a state-of-the-art airport, boasting a two-storey terminal, full night-landing facilities with boundary and obstruction lights, four floodlights and a rotating beacon. A 950yd concrete "fog-line" was also laid, and navigation aids included Marconi direction-finding equipment. By 1947 a large hangar was also being constructed alongside the original Bellman hangar.

The Guernsey Aero Club became one of BEA's many "associate companies" in February 1947, when the latter acquired Great Western & Southern Airlines, owner of the flying club, which thereafter became inactive and joined the long list of dormant BEA associates. A touch of glamour was provided at Guernsey by the presence of former Schneider Trophy and Supermarine test pilot Henri Biard, who was in charge of the airport's meteorological section.

Pre-dating both Jersey and Guernsey Airports, however, was the first licensed land-based aerodrome in the Channel Islands, on Alderney, the third-largest of the islands and part of the Bailiwick of Guernsey. In 1935 Capt Harold Benest of Jersey Airways established a company specifically to build an airport on Alderney, an island of barely three square miles, along with a hotel. A suitable field was selected at La Grande Blaye on the island's south-western tip and work began. Three grass runways were laid, the longest being 500yd, and a small iron shed was constructed and erected beside the runway. By October 1935 the simple airfield was ready to accept aircraft and its licence was accordingly issued on the 11th of that month.

After the war the airport underwent some refurbishment, reportedly with the use of German prisoners of war, although the luxuries of mains water and electricity at the airfield would have to wait until the 1950s.

FLYING SOUTH FOR THE SPRING

On April 29, 1947, little more than a week after BEA's inaugural London—Jersey Dakota service, John Stroud presented himself at Northolt, to sample BEA's new Channel Islands operation. Boarding C-47A G-AGZD, recently acquired from BOAC, John settled in for the 2½hr flight south in the capable hands of Capt Oakes.

It was to be a lightning visit, with a return to London the following day, but not before he had paid a visit to all three of the Channel Islands' airports, courtesy of BEA's Rapide fleet. On the morning of April 30, John took his place aboard Rapide G-AGSH, which, by happy coincidence, was to be flown to all points on the day's excursion by Sqn Ldr Derek Yapp, distinguished wartime fighter pilot and one of the two BEA pilots that had flown John from Croydon to Nutts Corner in Ju 52/3m G-AHOF the previous month. Taking off from Jersey in fine weather, with blue skies and scattered white clouds, John kept his camera to hand, snapping ships trailing wakes below pointed out by the Rapide's elegant elliptical wingtips.

The first stop was Guernsey, the island's

An unexpected visitor to Guernsey during John's island-hopping excursion was Miles Gemini 1A G-AISO (c/n 6326), which had been acquired brand-new by Woodley-based Air Contractors Ltd four months previously. By the end of the year, the Gemini had been purchased by Airwork at Blackbushe. It later went to Australia, where it crashed as VH-BDC in June 1962.

numerous glasshouses glinting in the sunlight as the Rapide let down along the distinctive white fog line stretching out across the grass. There was barely time for a cup of tea before John re-boarded G-AGSH for the 25-mile (40km) hop across to Alderney, which was duly visited and photographed before it was "all aboard!" once more for the return flight to Guernsey.

On arrival back at Guernsey, John took a little time to wander around the airport, photographing an unusual visitor in the form of Miles Gemini 1A G-AISO, operated by Air Contractors Ltd and presumably visiting the Channel Islands on business from its base at Woodley. After a brisk stroll and perhaps a refreshing "cuppa", John boarded G-AGSH for the last time for the short hop back to Jersey, where BEA C-47A G-AGIO and Capt Pugh were waiting to take him back to Northolt to end a busy day Channel Island-hopping.

Despite an extremely successful 1947 summer season on the Channel Islands services, BEA was still rather unsteady on its young legs in financial terms, and a number of changes were made with the announcement of the new winter timetable that October. The fares from London to Jersey and Guernsey were increased by 16s to £5 1s 0d, from Southampton by 11s to £3 11s 0d and from Jersey to Guernsey from 15s to £1 0s 0d, although reductions of 15 per cent and ten per cent on the sum of two single fares for monthly and 60-day return tickets respectively were allowed.

To add to this rather unwelcome fare rise, direct services from London to Guernsey were to be suspended over the winter season, the inhabitants of the latter having to take a Rapide to Jersey, where they would disembark and board a Dakota for London, and vice versa for the return. The people of Guernsey were far from happy, complaining loudly of a reduction of the service, for which they would have to pay more. The last BEA Croydon—Guernsey flight of 1947 was made by Rapide G-AGIF on November 1, the service being resumed (and not suspended again!) the following year from Northolt.

For his part, John apparently had no time to write up the Channel Islands trip, as during the following four weeks he managed to squeeze in a trip from Manchester to Croydon in an Avro XIX (and back in a Rapide) and several trips in *The Aeroplane* magazine's Auster Autocrat G-AERO, including a flight from Fassberg to Gütersloh in West Germany, which he visited in mid-May. Characteristically, while there, he managed to bag a flight in a No 21 Sqn Mosquito FB.VI over the Ruhr — but that, as they say, is another story . . .

BELOW ***Five of BEA's*** **Islander**-***class Rapides on the hardstanding at Jersey. In November 1947 the last Croydon—Guernsey direct service was made, all London services to the Channel Islands originating from Northolt from 1948, using Dakotas. The Rapides continued to be used, however, on services to the islands from Southampton.***

ARMCHAIR AVIATION

We take a look at what's available for the aviation history enthusiast in the world of books and other literature, from hot-off-the-press publications to reissued classics

R.J. Mitchell at Supermarine: From Schneider Trophy to Spitfire

By John K. Shelton; Standon Books; 7½in x 11½in (190mm x 289mm); hardback; 372 pages; illustrated; £27.50. ISBN 978-0-995678-10-1

DESPITE THE ACHIEVEMENTS and fame of some of his aircraft designs, Reginald Mitchell himself has remained something of an enigma. When he died in 1937 it appears that he left no memoirs or personal journals, and his only son, Gordon, at just 17, was deprived of the opportunity to get to know his father properly. Reginald's true character was badly served by the wartime propaganda film *The First of the Few,* and his former colleagues and others who may have known him well were noticeably reticent to provide more objective insight. This has left the stage clear for much speculation around his motivation, influences and character — and a good opportunity for his career at Supermarine to be reassessed to put the record straight.

This substantial tome is the author's third iteration on the subject of R.J. Mitchell, following *Schneider Trophy to Spitfire: The Design Career of R.J. Mitchell* (J.H. Haynes & Co Ltd) in 2008 and *From Nighthawk to Spitfire: The Aircraft of R.J. Mitchell* (The History Press) in 2015. The theme, and much of the content, is common to all three books and, as he states clearly in the acknowledgements, the primary source is *Supermarine Aircraft since 1914* by C.F. Andrews and E.B. Morgan, first published by Putnam in 1981. The author also quotes extensively and selectively from other published works of a similar era. This over-reliance on published secondary — or even in some cases tertiary — sources is unfortunate.

With three books written on the subject, the author obviously holds a very positive view of Mitchell, and not without reason, but his frequent use of "bold" or "innovative" to describe often rather mundane aspects of designs, including those introduced earlier by others, and the almost automatic assumption that Mitchell's aircraft were superior to those of his competitors, raises myriad questions. Comparisons are drawn with aircraft built for completely different purposes in order to try and justify this view, and the many Supermarine projects tendered to, but rejected by, potential customers in favour of competitors' designs, and which therefore remained unbuilt, are hardly mentioned. It is issues such as these, and the general lack of context — political, corporate, financial and technical — that leaves the narrative thread feeling distinctly unbalanced.

Unfortunately, it has to be said that there are also quite a number of errors in the text and drawings, particularly regarding the early years, of which some have been carried over directly from the books used as sources.

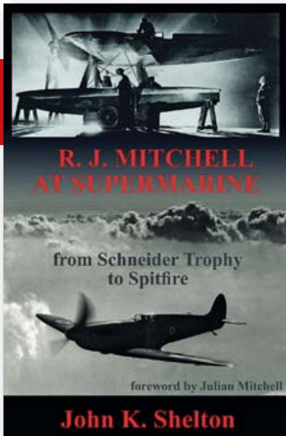
In the decades since Andrews and Morgan and others wrote their books, a significant amount of new archive material has become accessible to help provide a broader and more fleshed-out view of Mitchell's work. It is disappointing — and a missed opportunity — that little of this has been incorporated into this book.

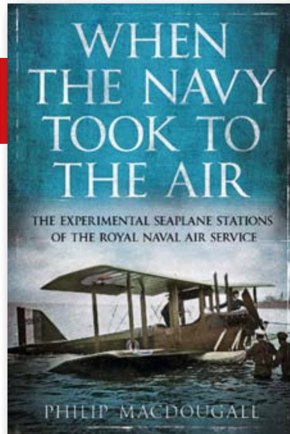
RALPH PEGRAM

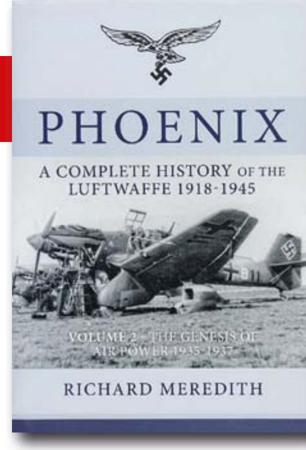
When the Navy Took to the Air: The Experimental Seaplane Stations of the Royal Naval Air Service

By Philip Macdougall; Fonthill Media Ltd, Macmillan Distribution (MDL), Cromwell Place, Lime Tree Way, Basingstoke, RG24 8YJ (www.fonthillmedia.com); 6¼in x 9¼in (158mm x 235mm); softback; 160 pages; illustrated; £18.99. ISBN 978-1-781555-72-9

INITIAL IMPRESSIONS of this book were not good. Alarm bells rang upon seeing misspelt names such as "Barton de Forest" for Baron de Forest, "Graham White" for Grahame-White,







Rolls-Royce unhyphenated, and reading that the Short S.41 tractor biplane was "similar in design" to the "Bleriot IX" in which Blériot flew the Channel, and that a company named "Beardsley" built the R.34 airship (which conjures up a vision of a phallic art-nouveau rigid airship design by Aubrey Beardsley).

It was also worrying to see that the author does not appear to have referred to anything written by Jack Bruce after 1955, and that he evidently places great trust in the autobiographies of Arthur Longmore and W.G. Moore. He quotes extensively from the latter, and this has led him to make erroneous suggestions and conclusions regarding Albatros biplane 890, flown at Grain. This was not a captured machine, as Moore assumed, and it most certainly was not a D I captured on the Western Front, as the author postulates. This aircraft's complete history is well recorded; the author has simply got it wrong (just as he has got the title of my article on it wrong as well).

A good deal of useful and interesting documentation from The National Archives (TNA) is presented, but although we are told of the Davis Gun and the Smith Static radial engine, these are not described or explained. There is a woefully inadequate index, and the 16-page glossy picture section includes some dreadfully poor copies and irrelevant images; and why include three pictures of Sopwith Cuckoos but none showing the experimental deck arrester gear tested on *HMS Furious*?

For all its shortcomings, this book might just be worth buying for the TNA material, but it should be used with the maxim *caveat emptor* in mind.

PHILIP JARRETT

Phoenix — A Complete History of the Luftwaffe 1918–1945: Volume 2 — The Genesis of Air Power 1935–37

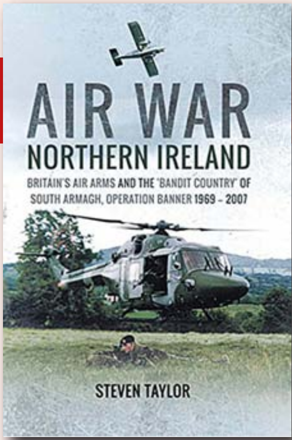
By Richard Meredith, Helion & Company, 26 Willow Road, Solihull, West Midlands, B91 1UE; 7in x 9½in (175mm x 241mm); hardback; 836 pages; illustrated; £59.95. ISBN 978-1-910777-27-5

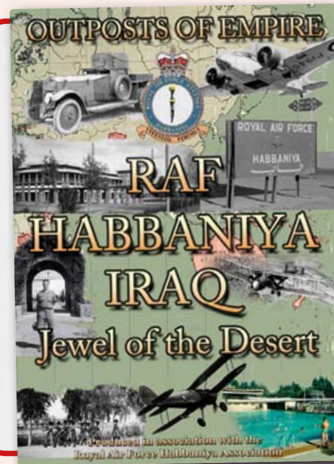
RICHARD MEREDITH continues his epic account of the history of the Luftwaffe in this second volume of his *Phoenix* project. As I mentioned in my review of the first volume (*TAH21*), this is truly an ambitious work, and at 836 pages he has produced a brick of a book. So, if, as the old adage goes, "size matters", is that the case here?

In *The Genesis of Air Power* the author tackles the years of growth and consolidation during the mid- to late 1930s. This was a fast-moving time in terms of ambition, design, output, expansion and doctrinal development — as explained in 1935's important *L.Dv.16* (Air Directive on Leadership of the Air War). Lessons were learned — and some were not.

Meredith illustrates the Machiavellian atmosphere that pervaded the very highest levels of Luftwaffe command during this most critical of periods. Goering balanced between having a strong and intelligent personality in Erhard Milch, effectively to run (but not quite) "his" air force, while also appointing more pliable (though no less intelligent) characters in the form of Kesselring and Wimmer to key roles, while attempting simultaneously to pull the strings and undertake other governmental tasks in the Reich. "You're ruining the Luftwaffe this way", complained Milch to his equally ambitious and ruthless superior. "Somebody has to be in charge of everything. If I don't do it then you'll have to . . . but you won't".

Meredith uses David Irving's still unmatched study of the Luftwaffe, based on Milch's diaries, for this. "The ancient Romans had a motto — *divide et impera*; divide and rule. But the Romans applied this only to their enemies, while you seek to do so against your friends. I cannot anticipate much success for you."





This, perhaps more than anything else, encapsulates so much about the Luftwaffe high command. Milch's prophetic warning to Goering would echo throughout the years to come. But these were still early days and the corridors of the *Reichsluftministerium* (RLM) were brimming with confidence. *Blitzkrieg* was three to four years away.

In this book, the emphasis, understandably, is on organisation and early structure, so the author provides detailed coverage of the RLM infrastructure, procurement, supply, training, development of the Flak arm, naval aviation (always an unsettled area), ordnance and the production programmes of 1935–37.

Meredith also tucks in the first years of the Luftwaffe's first campaign — the first time its guns were fired and its bombs dropped against opposition. It was in Spain that the Legion Condor honed the aircraft, airmen, tactics and weaponry that would fly through to Operation *Barbarossa* in 1941. The battles of Madrid, Jarama, Guadalajara and Bilbao (including the infamous assault on Guernica) are covered here, often with the aid of first-hand accounts drawn from other works. The viewpoint is neutral, tending to allow, wherever possible, the participants to "speak".

As with Volume 1, readers should not expect a light read: to put this into context, the first chapter begins after 71 pages of prelims, while the bibliography and list of sources runs to 29 pages. The narrative text is supplemented by charts and tables detailing ministerial and command structures, aircraft types, production and training programmes and unit compositions. But as before, this study rests on a huge range of secondary sources, rather than archival research, which are referred to in copious footnotes. When a primary source is mentioned, mostly it is attributed to the secondary source in which it is contained. For example, just one document is listed from the UK National Archives and it is credited to E.R. Hooton's excellent, similarly titled *Phoenix Triumphant* from 1994.

There is no doubt, however, that this is an impressive work and an incredibly valuable reference source, and I applaud the publisher wholeheartedly for doing those of us who are students of Luftwaffe history the good service of investing in its immensity.

So does size matter? Here it does.

ROBERT FORSYTH

Air War Northern Ireland — Britain's Air Arms and the "Bandit Country" of South Armagh, Operation Banner 1969–2007

By Steven Taylor; Pen & Sword Aviation, 47 Church Street, Barnsley, South Yorkshire S70 2AS; 6in x 9in (152mm x 229mm); hardback; 176 pages, illustrated; £19.99. ISBN 978-1-526721-54-9

IN AUGUST 1969 mounting tensions between Catholics and Protestants in Northern Ireland erupted into full-blown rioting in the streets, from Derry in the north to Armagh in the south. With eight dead and more than 750 injured, the British government was forced into restoring order and asserting the authority of the rule of law. As a result, British armed forces were deployed as part of Operation *Banner* — which was ultimately to continue for some 38 years, throughout what would come to be known as "The Troubles".

It was an apposite phrase. One of the most troubled areas during the conflict was South Armagh, which, thanks to the activities of the Provisional IRA, saw the government forces face a relentless campaign of terror, including roadside bombs, snipers and illegal vehicle checkpoints which would virtually close the road network in South Armagh, which quickly earned the nickname "Bandit Country".

As the roads became increasingly dangerous,

OUTPOSTS OF EMPIRE: RAF HABBANIYA, IRAQ — DVD

Produced and directed by Tod Nicol; available as DVD, or download via Vimeo (requires free Vimeo sign-up); running time 105min plus 10min extras. Website www.outposts-of-empire.co.uk. DVD £14.99, rent for 24hr via Vimeo £7.02, purchase for download via Vimeo £9.98

WHEN RAF HABBANIYA, originally known as RAF Dhibban, was officially opened in March 1937, it was the biggest Royal Air Force station in the world. Its tree-lined boulevards, air-conditioned buildings, polo club, tennis courts and extensive recreational facilities were to become famous over the next two decades, until it was finally handed back to the Iraqis in May 1959. Located on the banks of the Euphrates 55 miles (90km) west of Baghdad, and a short distance from Lake Habbaniya to the south, the RAF station was arguably Britain's most important garrison in the Middle East, a fact celebrated in this entertaining and informative film produced and directed by experienced cameraman and film-maker Tod Nicol. Divided into 13 chapters, the film uses extensive photographic and film archive material (along with first-hand accounts from some of those stationed there) to tell the full story of the strategically vital base, from the early days of aviation in the region, through the legendary siege during the Second World War, to its important role as a bulwark against Soviet aggression during the Cold War. It wasn't only military activity either; BOAC flying-boats were regular visitors to the nearby lake. A little rough around the edges in places — maps repeatedly refer to the "Ottomnan Empire" — this is nevertheless an extremely well-curated film with much to delight any aviation enthusiast with an interest in the RAF's adventures in the Middle East. **NS**

to the point of impassability, the security forces became more and more dependent on rotary-wing aircraft to move men and materiel from fortified bastion to fortified bastion, and it is largely the history of the helicopter during the conflict that is the subject of this book, although operations by de Havilland Canada Beavers and Britten-Norman Islanders are also covered. Written in a highly readable and concise style by freelance journalist Steven Taylor, the narrative rattles along, and numerous first-hand accounts provide a dramatic flavour of what it was like to be part of "the UK's Vietnam".

Primarily a regional operational history, this focuses heavily on the campaigns in South Armagh. While a broader approach, including more on policy decisions in the corridors of power and organisational doctrine would have been welcome, this is an excellent place to start for anyone — like this reviewer — with a rather hazy knowledge of the government forces' use of air power during this grim episode in Britain's military history.

The book is illustrated, although it's hard not to feel this element is something of an afterthought, as the rather meagre illustration section, incorporating a mere 17 photographs, is reproduced in flat black and white (probably from colour originals). Useful appendices are included, with details of aircraft crashes and forced landings in South Armagh during *Banner*, as well as leading particulars of the various aircraft operated by the RAF, Army Air Corps and Royal Navy throughout the conflict. There is also a good bibliography and a proper index.

NICK STROUD

Spirit of the Royal Air Force: One Hundred Years of Excellence

By Michael Fopp; Chris Andrews Publications (on behalf of The Royal Air Force Club Piccadilly and BAE Systems), Oxford OX2 0LX; 13½in x 10in (340mm x 250mm); hardback; 288 pages, illustrated; £35.00. ISBN 978-1-912584-03-1)

FEW PEOPLE realise that, as well as being the officers' club of the Royal Air Force, the RAF Club houses a world-class collection of aviation art. Original paintings by renowned artists adorn the public rooms and the ground-floor corridor in the club's premises at No 128 Piccadilly in Central London. They are a constant source of pleasure to members and visitors (*TAH* declares an interest here: we go there quite a lot), as is the dramatic stained-glass window soaring above the rear staircase. It is this collection, combined with art commissioned by BAE Systems over the years, that has inspired this book.

Written by former Royal Air Force Museum director general Michael Fopp, and with a foreword by HM The Queen, the lavish landscape-format volume outlines the RAF's past, present and future in 12 chapters, each beginning with a few pages of narrative text. In each case the text is followed by the real stars of the show — the paintings — well-reproduced in large size on right-hand pages, the facing page containing information about the artwork plus historical notes on the subject-matter.

Notable elements include Frank Wootton's magisterial *Peenemünde 1943*, a vast depiction of Avro Lancasters at night over hellish ground fires and smoke, with coloured flares, lines of tracer-bullets and searchlights piercing the gloom; and David Shepherd's oil-on-canvas of a 21 Sqn Scottish Aviation Twin Pioneer taking off in Kenya — it is actually the artist's very first wildlife painting, as the just-airborne Twin Pin is being charged by a rhino.

Appendices include a useful and interesting set of potted biographies of the artists whose work is featured. The book is a fine reflection of the character of both the RAF and its Club.

MICK OAKEY

BOOKS IN BRIEF

A quick round-up of what else is currently available for the aviation history enthusiast

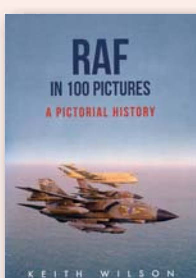
BRITISH AIRWAYS: 100 YEARS OF AVIATION POSTERS
Paul Jarvis
Amberley Publishing; ISBN 978-1-445679-28-0; £16.99

HAND IN HAND with the advent of commercial air travel came the dawn of the glorious art of the airline poster, and no nation turned the talents of its native artists to better effect than Britain. The sumptuous, giddily exotic work of the likes of Theyre Lee-Elliot, Stanley Herbert and Marshall Thompson for Imperial Airways in the 1930s established the gold-standard for such work, and this 6½in x 9½in compendium of more than 200 magnificent examples of the illustrator's art for British Airways and its predecessors, from the early days to the 2010s, gives plenty of room for the artwork to shine. Delightful. **NS**

AIRFRAME & MINIATURE No 12: THE SUPERMARINE SPITFIRE Pt 1
Richard A. Franks
Valiant Wings Publishing; ISBN 978-0-9957773-5-4; £19.95

ENCOMPASSING the Merlin-powered variants including Seafires, this softback 240-page modellers' bible follows the well-established pattern of this series, with "airframe chapters" on the development of the various marks plus their camouflage and markings, and "miniature chapters" featuring model-builds, directories of kits/accessories/transfers/books, and a comprehensive "in detail" walk-round using photographs and diagrams. Isometric views of each variant elucidate their differences, there are plenty of colour and line artworks, and fold-out 1/48th-scale drawings in the back of the book complete an impressive and indispensable package. **MO**

RAF IN 100 PICTURES: A PICTORIAL HISTORY
Keith Wilson
Amberley Publishing; ISBN 978-1-445666-02-0; £14.99

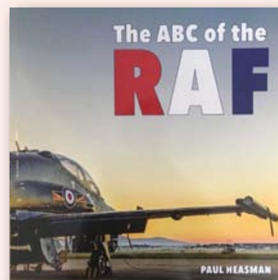


CELEBRATING THE RAF's centenary in 2018, this 96-page softback gathers together 100 images from the Air Historical Branch and largely lets the pictures do the talking. Much of the material has been little-seen before and is indeed superb, with good reproduction showing it off to good effect. With so much treasure to choose from, why the achingly dull Tornado/Nimrod shot was selected for the cover remains a mystery. **NS**

THE AIR STAFF AND THE HELICOPTER
Chris Gibson
Blue Envoy Press; ISBN 978-0-956195-16-6; £11.95

THE SIXTH IN Blue Envoy's largely under-the-radar but always invaluable *Project Tech Profiles* series, this 8½in x 11in 48-page softback is by deep-archive-miner and regular *TAH* contributor Chris Gibson. It takes a look at the British military's relationship with the heavier end of the helicopter spectrum, from the monstrous Cierva Air Horse, through some wonderfully weird contraptions (the Bristol Siddeley Flying Pig, anyone?), via the military Fairey Rotodyne to the introduction of the mighty Chinook and beyond. As with the rest of the series, the research is thorough, the analysis strong and the presentation unpretentious. Recommended. **NS**

THE ABC OF THE RAF
Paul Heasman
Published by the author, PO Box 1049, Stockton-on-Tees TS19 1XQ; no ISBN; £14.99 + £4.75 p&p in UK



A NEW TAKE on an old book title (persons of a certain age will remember Sir John Hammerton's 1943 version, with a front-cover portrait of a suave-looking RAF officer by Arthur Ferrier), this square-format softback is aimed at aviation-minded four-to-11-year-olds. Originally created by former RAF Valley-based QFI Heasman as a one-off photobook for his own daughter, it presents a clear, simple and authoritative introduction to the Service. A perfect Christmas gift for *TAH* readers' children, grandchildren, nieces and nephews! **MO**

X-PLANES No 8: BACHEM Ba 349 NATTER
Robert Forsyth
Osprey Publishing; ISBN 978-1-472820-10-5; £12.99

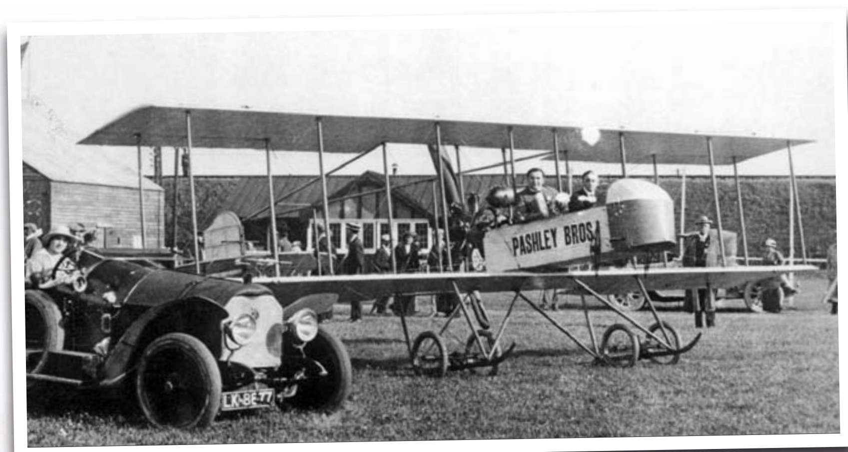
Osprey's *X-Planes* series continues onwards and upwards, this time thrown skyward from a vertical position by means of a highly unstable Walter rocket powerplant. Luftwaffe specialist Robert Forsyth expertly details the genesis and development of the Natter (Snake), one of Germany's more desperate air-defence concepts; the rocket-powered wooden airframe was expected to be semi-expendable — clearly, so were the unlucky pilots intended to fly it. Excellent value. **NS**

Lost & Found

***PHILIP JARRETT** explores the lesser-known corners of aviation history, discovering unknown images and rediscovering long-lost details of aircraft, people and events. This time he solves a mystery relating to a Farman-type flying machine built for the Pashley brothers*

WHILE RESEARCHING a pair of newly-acquired postcards I inadvertently discovered an early aeroplane that seems to have eluded previous listings of British pioneer aircraft in later books. My pictures featured a Farman-type biplane flown from Shoreham to Horsham in Sussex and back by Mr W.H. Elliott on April 21–22, 1914. Just before this event, in its issue dated April 2, 1914, *The Aeroplane* reported that the Pashley Flying School at Shoreham, run by the brothers Cecil and Eric Pashley, had added "a Farman-type boxkite, 50 h.p. Gnome, built by Messrs Dowland and Clarence" to its fleet. This machine had a canard elevator, a biplane tailplane and twin rudders.

The report then added that, "to cope with the increasing number of pupils, Pashley Bros are completing a second biplane of 32ft [9·8m] span and 30ft [9·1m] overall length, single-surface tail, fitted with a 40 h.p. watercooled engine". Designed by Eric Pashley, this machine had no canard elevator, a monoplane tailplane and a single rudder. Work on it was proceeding well by the end of June, and the magazine reported that "the brothers Pashley flew a new 50 Gnome biplane" at Shoreham aerodrome's inaugural meeting of the season on July 11–12, so the intended watercooled engine was evidently not installed. In its July 17, 1914, issue, *Flight* reported that "the tests of the new pusher biplane were quite satisfactory. The Brighton Cup was won on Saturday and the speed race on Sunday". Despite their distinct differences, the earlier Dowland and Clarence machine had become confused with the Pashley and was effectively "lost" from the record. We can now put things to rights by publishing pictures of both machines.



LEFT *The biplane built by the Pashley brothers at Shoreham, distinguished by its lack of a canard elevator, monoplane tailplane and longer nacelle with titling along its sides.*

BELOW *Mr Elliott about to depart from Horsham on April 22, 1914, in the Farman-type biplane built for the Pashley brothers by Messrs Dowland and Clarence. Note the short nacelle, canard elevator and biplane tail.*

The Melon Run

Jordan to Luton by Dove & Heron, 1965

In August 1965 **ED WILD** was working as a staff pilot for McAlpine Aviation at Luton when a job came in to organise a retinue of pilots and head off for Jordan, where a fleet of ex-Royal Jordanian Air Force de Havilland Doves and Herons was waiting to be ferried back to the UK for Riley conversions. It was to be a memorable few days, as he recalls . . .

THE ADVERTISEMENT appeared in a UK aviation magazine as follows: "Suitably qualified pilots required to undertake a delivery flight of [a] Dove or Heron from Amman to Luton. All expenses paid — plus £100 on safe delivery". I thought the response would find me overwhelmed with bored — or broke — pilots. In the event, there were fewer than 20 replies.

In the summer of 1965 I was a staff pilot flying for McAlpine Aviation at Luton Airport, a company which had widened its early involvement in UK executive aviation, and had set up a production line to re-manufacture examples of the twin-engined de Havilland Dove and its four-engined successor, the Heron, under licence from the Riley Corporation in the USA. The refurbished Doves and Herons would have Lycoming engine power, plush executive interiors and new paint jobs to become Riley Turbo Executive 400s and Riley Turbo Skyliners respectively. Suitable donor airframes were needed, and McAlpine had secured the purchase of six aircraft — four Doves and two Herons — from the Royal Jordanian Air Force (RJAF).

I was given the task of making arrangements to ferry the aircraft on the initial ferry flight from Jordan to Luton and learned that, although the aircraft had been standing for some time in the desert, they were serviceable. Little other information was forthcoming, but, apart from being given uncomfortably short notice, the task offered the prospect of an interesting trip.

The advertisement attracted a few promising candidates. Some of them were well known to me, including the late Dennis Milburn, a former Jersey Airlines colleague, who I knew was reliable and a sound operator. Another was Roy Bartman, formerly of BOAC and Britannia Airways (and known invariably as Batman) — very experienced and a great joker. Both were people I would want on any team. We were

also joined by Mervyn Tew, one of McAlpine's own engineers; a happy individual with a large toolkit. Mervyn's role was to be our "flying spanner", taking care of any en-route serviceability problems.

The other pilots were previously unknown to me, and, after spending several hours on mainly unfruitful telephone calls to various sources, I selected what I thought were the most suitable half-dozen; they had to be taken on trust. I would bring back one of the Herons myself.

After a few days of scrambled preparations, we gathered at Heathrow one morning in late August 1965 for the airline flight to Amman. After introductions all round we had our first setback; one of the hired pilots failed to show at check-in. We craned our necks over the heads of the throng, hoping to see a flushed individual running to check-in, apologising breathlessly; we were to be disappointed. Hasty telephone calls were made but failed to provide any clues. It was too late to do anything now — we were going anyway. The sixth aircraft would have to be sorted out later.

We fell into beds at our Amman hotel that night, only to be awakened far too early by the muezzin calling the faithful to prayer from a mosque adjacent to the hotel. After breakfast, enlivened by Batman calling for pork sausages (he got them), we were collected by a Royal Jordanian Air Force bus to take us to the airport.

Amman was busy at that time of the morning, and the ride to the military air base was subdued and tediously slow. Horns blared and sleepy-eyed pedestrians dodged traffic. I used the time to distribute a set of checklists and aeronautical charts covering our planned route to each dozing pilot. Before arriving at the base, someone pointed out a stall by the roadside selling large watermelons. We decided to take some home with us and duly got a good price from the vendor — on the proviso that he deliver them to our aircraft. "No problem" was the smiling response, and he closely followed our official bus on to the apron — security wielded a lighter touch then.

LAST-MINUTE PROBLEMS

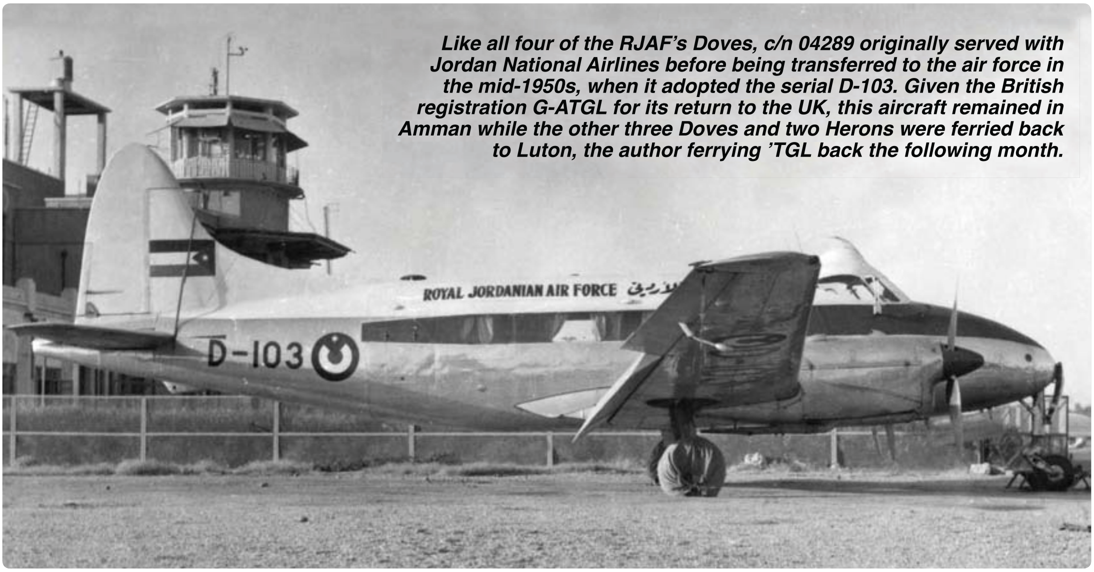
The air base was a hive of activity, with our aircraft lined up waiting for us on the tarmac, being pre-flighted by smartly overalled RJAF engineers. I requested full fuel tanks for all of the aircraft. An undertaking of this sort usually provides some last-minute problems, and in this case there were suddenly four more; one of the Dove pilots reported that his aircraft only had a three-channel VHF radio.

We soon discovered that all four Doves had the same radio fit (the Herons had dual VHF radio and VOR/ADF equipment). This narrowed our options somewhat and dictated VFR (visual flight rules) conditions for the Doves. Additional channels were available by unplugging a frequency crystal in flight and substituting alternatives. However, my request for 12 different frequency crystals — times four — was too much for our otherwise helpful Flight Sergeant. "Chiefy" just didn't have that many crystals available. In any case the fiddly job of juggling crystal changes while flying in formation was unappealing. Three radio frequencies may have been fine for local military flights in Jordan, but it was certainly not going to be sufficient for our flight across Europe.

We discussed the problem and decided to use one frequency for inter-formation communication, while in the Heron I switched back and forth between the ATC frequency in use and the formation frequency in order to relay ATC instructions to the Dove pilots. It was a step up from two cocoa-tins joined with a length of string — but only just.

OPPOSITE PAGE, TOP ***Heron c/n 14127 was delivered to the Royal Jordanian Air Force as H-106 in January 1959, and was flown by the author from Amman to Luton on August 28, 1965, registered G-APPD.*** **BELOW** ***The Doves and Herons undergo inspection at Amman before the ferry flight. The Doves became G-ATGI, 'TGJ, 'TGK and 'TGL.***

HERON: TAH ARCHIVE / BELOW: AUTHOR'S COLLECTION



Like all four of the RJAF's Doves, c/n 04289 originally served with Jordan National Airlines before being transferred to the air force in the mid-1950s, when it adopted the serial D-103. Given the British registration G-ATGL for its return to the UK, this aircraft remained in Amman while the other three Doves and two Herons were ferried back to Luton, the author ferrying 'TGL back the following month.

PHILIP JARRETT COLLECTION

Everybody was offered a test flight in the aircraft they were to deliver. Surprisingly, there was only one aircraft with problems, and that was quickly solved. One pilot managed to poke his finger right through a fabric-covered control surface during pre-flight, but this was quickly patched, an indication of how long some of the aircraft may have been sitting in the desert.

We decided to use a loose formation, with me in one of the Herons as lead, navigating and doing the radio transmissions. The remainder would fly at a suitable distance with the second Heron at the rear to act as shepherd. I hoped that the weather would stay on our side.

A final task was required before departure. British civil registrations for all the aircraft had already been issued by the Ministry of Aviation, and all we had to do now was apply them to the aircraft. I had given scant thought to this aspect before leaving the UK, but Chiefy came up trumps, producing a bucket of black paint and a few brushes. This brought out the dormant artists in us; the results would definitely *not* have satisfied the Ministry.

Although brief, our time in Jordan was met with hospitality and generosity from all with whom we came in contact. It was not to last.

HOMEWARD BOUND

With the formalities completed, we departed Amman on August 28, 1965. The melons were strapped one to each seat. Someone had painted on smiley faces, which grinned back at us from the cabin. The planned route was Amman—Nicosia (Cyprus)—Rhodes (Greece)—Ciampino (Rome)—Marseille (France)—Luton. A number of factors, however, had us landing at other airfields as well. During the formal handover of this little fleet, the Commander of the RJAF air base informed me that he had spoken to

THE LIFE OF (JACK) RILEY

JACK M. RILEY (**RIGHT**) was a hard-nosed Texan businessman, who, after retiring from the printing trade in 1952, became an American agent for de Havilland, selling 19 D.H.104 Doves in his first six months. He later parted company with de Havilland and formed the Riley Aeronautics Corporation in Fort Lauderdale, Florida, selling re-engined and re-styled general aviation types, including the Cessna 310, upgraded versions of which became the Riley 65, Rocket and Turbo-Rocket.

This was followed in 1963 by a major conversion of the Dove, which led later to a similar treatment for the de Havilland D.H.114 Heron. Riley had seen a gap in the American market for an upmarket executive aircraft. British-built Doves were already in service in the USA, but by replacing the Dove's original six-cylinder D.H. Gipsy Queen engines with a pair of 400 h.p. eight-cylinder turbocharged fuel-injection Lycoming engines, the aircraft's cruising speed and range were substantially improved, while its empty weight was lowered. These Lycoming Doves were branded Riley Turbo Executive 400s.

Other changes offered were flush-riveting of the entire wing from leading edge back to the rear spar and epoxy coating of the leading edge, as well as the replacement of the original TKS de-icing system with Goodrich de-icing boots; the flightdeck was re-manufactured to include a one-piece instrument panel and improvements were made to the field of vision; a new swept fin and rudder was also incorporated, although this modification was not approved in the UK. Reclining passenger seats and other improvements in the interior were also incorporated, and the existing paint was stripped and the aircraft re-finished with epoxy resin paints. The Herons, however, underwent only the fitting of four 290 h.p. Lycoming IO-540-G1A5 engines, with the optional extra of turbo-superchargers. **EW**

TAH ARCHIVE

The prototype Riley Turbo Executive 400, N1472V (c/n 04302) alongside the first three Doves to be converted by McAlpine — G-ASUX (No 3), 'SUV (No 2) and 'SUW (No 1) — at the company's Luton HQ in 1965.

his opposite number in Syria, who had issued authority for us to overfly Damascus, thereby avoiding delay (and landing fees!).

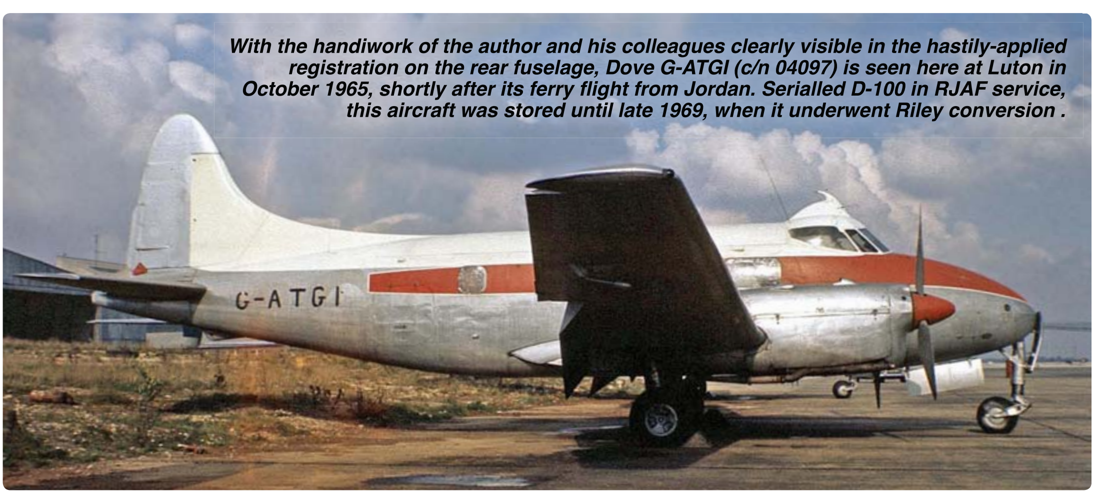
As soon as I was in contact with Damascus ATC I confirmed our flight details, adding that we had permission to overfly. The response was an order to land or face the consequences. No amount of talking on my part made any difference. "Fighters are on the runway" was the reply. I didn't believe that the threat was real — but nor did I want to find out. We duly landed and paid up.

Getting to Nicosia before sunset now looked unlikely. I was not unduly worried about this as the pilots were all experienced professionals, but we'd had a long day and people were tired. As we approached Cyprus, the sun was already disappearing in the west. The lights of Larnaca gleamed brightly and villagers along the coast were preparing for a stroll in the cool evening air. After establishing radio contact with Nicosia,

McALPINE & THE RILEY DOVE

BY 1964 DOVE conversions had commenced at Riley's Fort Lauderdale factory. In 1965 the Aviation Division of Sir Robert McAlpine & Sons Ltd at Luton was appointed sole agent outside the Americas for this work. In partnership with Keegan Aviation Ltd, also based at Luton, McAlpine completed its first Dove conversion, a Riley 400 (Dove c/n 04256, registered G-ASUW), during the summer of that year. Used Dove airframes were obtained worldwide, and completed conversions sold for upwards of £70,000, depending on radio fit. Customers who supplied their own used airframe received a £17,000 credit. A choice of seating was available, accommodatiing up to 11 passengers in a high-density version.

Although the author collected a pair of Herons along with the RJAF Doves, neither was converted by McAlpine, although Heron c/n 14126, formerly H-105 in RJAF service, was later converted by Riley in the USA to become N782R. **EW**



With the handiwork of the author and his colleagues clearly visible in the hastily-applied registration on the rear fuselage, Dove G-ATGI (c/n 04097) is seen here at Luton in October 1965, shortly after its ferry flight from Jordan. Serialled D-100 in RJAF service, this aircraft was stored until late 1969, when it underwent Riley conversion .

ADRIAN BALCH / PHOTAIR PRESS

Resplendent in its McAlpine Aviation colours, G-ATGJ (c/n 04113), formerly D-101, is seen here at Luton in 1970, following its conversion to Riley configuration with Lycoming engines. It later went to Australia as VH-ABK. The two ex-RJAF Herons, H-105 and H-106, became N782R and G-APPD respectively, although only the former was converted to Lycoming power.

PHILIP L. JACKSON

I returned briefly to the common radio frequency to hear one of the Dove pilots requesting help in locating light switches; thankfully, this was quickly provided.

After we had landed in the increasing gloom at the old Nicosia Airport (since closed), taxis were organised to take us to a hotel. Dennis Milburn, sitting in the back seat of one of the taxis, had placed his hand in the door opening. The driver, failing to see it, slammed the door on his fingers. He was in considerable pain but refused medical treatment and wanted to get to the hotel and retire with a bottle of whisky.

DISTURBING 'IL PAPA'

The following day, Mervyn, our "flying spanner", joined Dennis in the second Heron to provide assistance if needed. Apart from Dennis's throbbing hand, by now turning a fashionable shade of plum, there were no further problems until we approached the eastern coast of Italy. A build-up of cloud sitting on the hilltops looked likely to demand a re-filing of our flight plan, and for us to continue as an instrument flight. It was either that or a spell of "scud-running". Conscious of our comms issues, I opted to go beneath the cloud and remain VFR, and we sailed through, although the 500ft (150m) rule may have been bent a little.

Arriving at Ciampino, all except one Dove landed. The fifth aircraft was missing. We were debating this on the tarmac when, with squealing tyres, an agitated airport official drove on to our parking area. To the accompaniment of elegant hand gestures he informed us we were forbidden to depart. Not only that, he continued, but the missing Dove pilot would be arrested. The straggler landed just as a contingent of local police drove up, sirens sounding. It transpired that the Dove had undertaken a low-flying tour of the Tiber and Vatican City. "Nobody complained in 1944", muttered the miscreant peevishly. The incident was eventually settled amicably and we were allowed to continue.

The remainder of the delivery was an anti-climax. We routed via Marseille, then to the north-east of Paris (Charles de Gaulle Airport was still a sketch on an architect's pad then) and, after coasting into the UK, passed overhead Stapleford Tawney in Essex, where I became aware of people running out of hangars and pointing skywards. We closed up the formation and swept raggedly over Luton Airport, completing the ferry flight on August 31.

THE RIPE STUFF

Two days later I inspected all the aircraft and was struck by a faint — but vaguely familiar — smell. A number of melons sat patiently, grinning away, in their seats, still waiting to disembark. I was also surprised to find that one of the pilots had left on board the charts that I had distributed in Amman, still in their sealed envelope; a touching display of misplaced confidence in my ability as a navigator. The charts were used when returning from Amman with G-ATGL — the final Dove — the following month. I delivered it to Luton on September 26, 1965, to rejoin its erstwhile fleet-mates. This time the flight, via Damascus, Rhodes and Andravida in Greece, Brindisi and Pisa in Italy, and Lyon in France, was incident-free.

Another Dove was to retrace our route, but this time in the opposite direction. Opening *Flight* magazine one morning some time later, I saw that the RJAF had placed an order for a Riley Dove "for the personal use of King Hussein of Jordan".

CZECH – SIX Publications

Price £10.90

Price £10.90

Price £14.50

Price £10.50

Just some of our most popular profiles to date, in this our 25th year of business:
Czech-Six Publications is the authorised UK distributor for Publications MBI of the Czech Republic.

Specialist military and aviation titles for the enthusiast and modeller, fully bi-lingual in Czech and English.
Each title features Period Photographs, Scale Plans, Detail Drawings and Colour Artwork.

For more information on the books shown above and all our available titles,
postage rates and payment methods, please visit:
www.czechsixpublications.com or e-mail **mark.csp@btinternet.com**

Czech-Six Publications, 11 The Walled Garden, The Street, Betchworth, Surrey, RH3 7DH
Telephone: 01737 842403

OFF THE BEATEN TRACK

PHOTOGRAPHS BY THE AUTHOR

Ever turned a corner to find something unexpected? The Aviation Historian's *intrepid aeronautical explorer* ***PETER DAVISON*** *investigates the stories behind the oddities that turn up in the most unusual places . . .*

DESIGNED BY the legendary Kurt Tank — his first aircraft for the company — and instrumental in establishing the Focke-Wulf Flugzeugbau as a world-class aircraft manufacturer, the Fw 44 Stieglitz (Goldfinch) made its maiden flight in the late summer of 1932. A single-bay strut- and wire-braced biplane, the type quickly gained a reputation as a robust and agile two-seat trainer, especially suitable for aerobatics.

During Finland's 1939–40 Winter War with the Soviet Union, Denmark raised funds to supply the Finnish Air Force with 30 Fw 44Js with which to train Finnish pilots, and which were delivered in the summer of 1940. Five additional examples were acquired in 1944 and remained in service until 1960, when the 15 survivors were sold on to the civilian market.

Powered by a seven-cylinder Siemens-Halske Sh14A air-cooled radial engine, the Fw 44 was probably the inspiration for Finland's indigenous biplane trainer, the similarly-engined Valtion Lentokonetehdas Viima (Gale), which first flew in November 1936. The prototype of a run of 24 built at Tampere during 1937–39 is preserved in that city's town square in a glass case. The Viima is slightly shorter and wider than the Fw 44 but certainly bears more than a passing resemblance.

TOP ***Focke-Wulf Fw 44J SZ-18 was restored during 2002–08 and now hangs in the Tuulonen shopping centre at Tuulos, about 60 miles (100km) north of Helsinki.*** **ABOVE** ***The first Valtion Viima, VI-1, in its glass enclosure at Tampere in southern Finland.***

The suspended Stieglitz seen here resides in an aviation-themed shopping mall at Tuulos, the centrepiece of which is a Douglas DC-2 in a glazed museum with a Saab Draken and MiG-21 displayed beside the car park. Another "SZ-18" survives in Germany as D-EXWO, although it was marked as SZ-12 at Woburn in 2014.

Find us on Facebook at *www.facebook.com/The Aviation Historian* and Twitter *@AvHistorian*

Coming up in future issues:

Eagle of the Nile *The Helwan HA-300 was a truly international affair — a German design developed in Spain, then Egypt and first flown by an Indian, as João Paulo Moralez relates*

Our Man in Hollywood *Matt Bearman chronicles the remarkable life of Wg Cdr James Addams — RAF aerobatics specialist, Lend-Lease test pilot and bit-part movie actor*

Dart Herald vs 748 *James Jackson takes a look at the political backdrop to the competition for state support for Britain's turboprop-powered Dakota replacements*

TAH

The Aviation Historian®

The modern journal of classic aeroplanes and the history of flying

Be certain to receive each new issue of The Aviation Historian *hot off the presses, by taking out a subscription. It's quick and easy to do. Issue 26 published January 15, 2019*

ALL BACK ISSUES AVAILABLE *(No 1 now reprinted!)*

Annual Print Subscription for one year (4 issues): **£44** (UK), **£53** (Europe), **£62** (RoW)

See our website for more details of both print and digital versions:

www.theaviationhistorian.com

TEL 07572 237737 WRITE TAH, PO Box 962, Horsham RH12 9PP, UK

Digital edition available via our partners pocketmags.com

Available on the App Store | Available on kindle fire | Available on PC & Mac | Available on BlackBerry | Available on the Google play

WHAT THEY'RE SAYING ABOUT *THE AVIATION HISTORIAN*

"The latest issue is a ripsnorter. I'm still wiping the drool off the pages after flicking through! " — Subscriber Dr Anthony Cooper, Brisbane, Australia

"Your journal is the only bright spot in the current wasteland of historical aviation magazines, and I await every issue with bated breath. Every issue is engaging, informing and entertaining" — Subscriber Ian Gavaghan, Ontario, Canada

"Looking forward to it. Singularly the finest of its genre. Essential reading for aircraft obsessives!" — Reader William Martin, London

"*The Aviation Historian* is the best English-language aviation history publication available today" — aviation historian Tom Cooper

munich & the 1938 “dodgy dossiers” / viscount in america pt 2 / Yak-28PP / japan’s wartime air link to germany / procuring the phantom / SE.1010 / the RAF far east flight / convair’s waterborne fighters pt 1 / flight refuelling harrows

The Aviation Historian®

The modern journal of classic aeroplanes and the history of flying

TAH